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Aim

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Original Article

Comparison of the Aggression Levels between National Level Combat Sports Athletes and National Level Non-Combat Sports Athletes

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Abstract

In the society we live in today, sports could be the one thing in which, aggression is not only tolerated but is encouraged and considered to be acceptable behaviour. The society identifies combat sports to be violent and aggressive by its nature than its counterpart. Current study's main objective was to determine the difference in the levels of aggression between national level combat sports athletes and national level non-combat sports athletes in Sri Lanka. Further as the specific objectives, the differences in verbal aggression, physical aggression, anger, and hostility levels between national level combat sports athletes and national level non-combat sports athletes were also determined. A descriptive cross-sectional study was conducted using 133 athletes. Data were collected using an online questionnaire that included Buss-Perry Aggression scale. Data were analysed using SPSS version 25. Majority (72.9%) of the participants were males whereas 27.1% of the participants were females. Of the participants, 53.4% athletes were combat sports athletes and 46.4% were non-combat sports athletes. Hostility scores between combat sports athletes and non-combat sports athletes was not significantly different. The results of the study do not support the negative stereotypes concerning the perceived brutality of martial arts and combat sports, stating the combat sports makes the practitioner more hostile; whereas it suggests that the type of sports practice has no effect on hostility. These findings can be used in debunking negative stereotypes in order to educate and attract the sporting communities to practice combat sports.

Keywords: *Combat sports, Sports psychology, Aggression, Anger, Hostility*

Introduction

Aggression is a psychological construct which has been researched by numerous social scientists and psychologists on numerous occasions. In the society we live in today, sports could be the one thing in which aggression is not only tolerated but is encouraged and considered to be acceptable behaviour. According to (Russell, 1993), this occurs as we humans tend to perceive aggression very differently in different scenarios. Aggression consists of four main sub traits: verbal aggression, physical aggression, anger and hostility. Harming is considered a result of aggression where both verbal and physical aggression is combined. Aggression is not an independent construct; rather, it depends on anger, which is the psychological bridge and the psychological arousal that prepares an individual for aggression, and hostility, which is the sensation of ill will and injustice (Buss & Perry, 1992).

Szabo & Urbán (2014), mentions that the definition of combat sports according to 2008 Combat Sports act of New South Wales as "any of the following or a combination of any of the following: (a) boxing (or fist fighting) in any of its styles, (b) kickboxing in any of its styles, (c) any sport, martial art or activity in which each contestant in a contest, display or exhibition of that sport, art or activity is required to strike, kick, hit, grapple with, throw or punch one or more, other contestants and that is prescribed by the regulations, (d) sparring in any category covered in paragraph (a)–(c), except to the extent prescribed by the regulations."

The contemporary society identifies combat sports as violent and aggressive by nature (Bosson, et al., 2009). Despite the fact that combat sports have proved to be helpful in moral education and have a decreasing effect on social brutality, social perception of such sports are yet quite the contrary. The general opinion on combat sports is found to be negative in nature and the majority believes that these sports are associated with high levels of aggression in practitioners of combat sports. Further, combat sports athletes are perceived with the stereotype concerning the perceived brutality of martial arts and combat sports (Rogowska & Kuśnierz, 2013). According to Rogowska & Kuśnierz (2013) these negative attitudes cause individuals not to participate in these sports.

Although the majority of existing literature suggests a decrease in hostility upon increased involvement in the martial arts, these claims are contrary to Bandura's social learning model of hostility and aggression (Daniels & Thornton, 1992). Unlike instinct theories or the frustration-aggression hypothesis in sports psychology, social learning theory explains that, like any other social behaviour, all human aggression is learned by imitation and reinforcement (Jarvis, 1999). According to instinct theories, sport provides a legitimate way to express aggressive instincts, which results in the reduction of aggression in the community. The frustration-aggression hypothesis also suggests a similar idea: Sport is beneficial because it acts as a release for frustrations. Social learning theory fails to explain the existing literature supporting the idea that martial arts and combat sports training reduces rather than increases aggressive behaviour (Jarvis, 1999). Martial arts and combat sports offer a direct way of testing these contrasting views as, by nature, martial arts and combat sports make use of aggressiveness. If the social learning perspective is accurate, combat sports practitioners should have increased levels of aggression compared to their counterpart. Non-combat sports and martial arts training differ in the aggressive exposure to their respective practitioners. Apart from decreasing the effect on aggression, Szabo & Urbán (2014), suggest that there is an effect of combat sports in developing emotional regulation & emotional intelligence. The current study is focused on studying the claims of social learning theory to be true by comparing the aggression levels of combat sports athletes and non-combat sports athletes.

Modern martial arts/combat sports were introduced to Sri Lanka in the 1970. When considering the development and progression of martial arts & combat sports in Sri Lanka with their counterpart, it is evident that combat sports have failed in its development compared to non-combat sports. Even long before foreign martial arts were introduced, Sri Lanka owned its unique Martial art/combat sport named 'Angampora', which has eventually lost its popularity in the modern era as Sri Lankan communities are reluctant to participate in combat sports. Rogowska & Kuśnierz (2013) states that according to the theory of reasoned action, the stereotypes about combat sports that emphasize the brutality and aggressive nature of martial arts and combat sports have a significant influence on the attitude towards it. Even though it has not been proven in the Sri Lankan context to be the reason for decreased popularity of combat sports, the general belief is the negative attitude. This study takes the initiative to prove that aggression levels in athletes have no significant association with the type of sports practised, which will subsequently aid in challenging the negative stereotyping associated with combat sports.

Methodology

A descriptive cross-sectional study was conducted to determine the difference in the levels of aggression between national level combat sports athletes and national level non-combat sports athletes in Sri Lanka. Ethical approval (KIU/ERC/20/42) was obtained from the Ethics Review Committee of KIU. The data were collected from July 2020 to August 2020 from national-level combat sports and non-combact sports athletes of Sri Lanka. The convenience sampling method was used and the inclusion criterion for participants were as follows: age above 18 years, having more than 5 years of training experience and have won at least one national level medal within the last 3 years in their respective sports. The sample size was calculated using Cochran formula (estimate prevalence 50%). From 223 respondents, respondents who reported having a diagnosis of a mental disorder were excluded.

The participants were assessed using a self-administered questionnaire which consisted of demographic questions and The Buss-Perry Aggression Questionnaire (Buss & Perry, 1992). The face and content validity were ensured for the Buss-Perry Aggression Questionnaire. The demographic questionnaire gathered data relevant to age, gender, type of sport, years of experience in their sport, years of collegiate experience in their sport, and level of achievements in the last three years. Demographics were kept for record-keeping, checking inclusion & exclusion criteria and analysis. Whereas, The Buss-Perry Aggression Questionnaire consisted of four parts that were measuring physical aggression, verbal aggression, hostility, and anger.

Data were analyzed using SPSS version 25. The t-test and one-way independent measure multivariate analysis of variance (MANOVA) were used to analyse the data.

Results

Socio-demographic characteristics of the participants

In this study, a total of 223 participants completed the questionnaires. 90 participants who did not meet the inclusion criteria and those who met exclusion criteria were excluded from the final analysis. Among 133 participants, 27.1% (n=36) were females and 72.9% (n=97) were males. Of them, 53.4% (n=71) were combat sports athletes and 46.6% (n=62) were non-combat sports athletes. (Table 01).

Table 01: Sociodemographic information of the participants

Variable	Frequncy (n=133)	Percentage (%)
Age		
18-30	80	60.2
31-40	36	27.1
41 years and above	17	12.7
Gender		
Male	97	72.9
Female	36	27.1
Type of Sports		
Non Combat Sports	62	46.6
Combat Sports	71	53.4

The subscale analysis revealed that, on average, combat sports athletes scored 19.23 (SD = 7.04) on the anger subscale, whereas non-combat sports athletes scored 21.0 (SD = 7.14) (possible range of 7 to 35) and combat sports athletes scored 15.13 (SD = 3.96) on verbal aggression subscale where non-combat sports athletes scored 16.39 (SD = 4.51) (possible range of 5 to 25). On hostility subscale scores, combat sports athletes have a mean of 22.55 (SD = 7.16) where non-combat sports athletes have a mean of 22.89 (SD = 7.16) (possible range of 8 to 40). On physical aggression subscale scores, combat sports athletes have a mean of 24.68 (SD = 7.57) where non-combat sports athletes have a mean of 26.50 (SD = 9.01) (possible range of 9 to 45). Though these scores demonstrate that non-combat sports athletes have slightly higher means in all the subscales, according to the average scores from the original Buss & Perry (1992) paper, all the subscales gave scores within average range.

Differences in aggression levels between national level combat sports athletes and the counterpart

To test the hypothesis, national level combat sports athletes demonstrate higher levels of aggression than national level non-combat sports athletes in Sri Lanka, an independent samples t-test was conducted. The results of the t-test determined that there was no significant difference in total aggression, t(131)=-1.156, p = 0.518, between combat sports athletes and non-combat sports athletes.

Differences in physical aggression, verbal aggression, anger, and hostility levels between national level combat sports athletes and the counterpart

To determine if there is a significant difference in sub-traits of aggression between national level combat sports athletes and national level non-combat sports athletes in Sri Lanka, one-way independent measures multivariate analysis of variance (MANOVA) test was conducted. The one-way independent measures multivariate analysis of variance test determined that there was no statistically significant difference between combat sports athletes and non-combat sports athletes on the combined dependent variables, F (4)= 1.06, p = 0.38; Pillai's Trace = .03 partial Eta squared = .03. The MANOVA test also revealed that there is no significant difference in scores for anger scores between combat sports athletes and non-combat sports athletes, F (1)= 1.22, p = 0.27; and it also revealed that there is no significant difference in scores for verbal aggression scores between combat sports athletes and non-combat sports athletes, F (1)= 2.90, p = 0.09; and it also revealed that there is no significant difference in scores for hostility scores between combat sports athletes and non-combat sports athletes, F (1)= 0.07, p = 0.79; and also no significant difference in scores for physical aggression scores between combat sports athletes and non-combat sports athletes, F (1)= 1.61, p = 0.21.

Discussion

Existing literature supports both the idea that combat sports athletes are less aggressive than non-combat sports athletes (Keeler, 2007; Kuśnierz et al.,2014; Pasternak et al.,2020; Reynes & Lorant,2001) and with most recent findings, combat sports athletes being more aggressive than the non-combat sports athletes (Barczak et al., 2020), but there is a gap in the literature comparing the aggression levels of combat sports athletes and non-combat sports athletes when considering important facts such as balanced and unbiased samples, the performance level of athletes thus creating a need for continued studies in this area of sport behaviour.

Type of sports and total aggression

Based on the previous literature, combat sports athletes were expected to score higher on total aggression in the Buss-Perry Aggression Questionnaire (BPAQ). An independent samples t-test revealed that there is no strong, significant difference between national level combat sports athletes and national level non-combat sports

athletes in their total aggression scores. In fact, these scores are within the average range according to Buss & Perry (1992), suggesting that none of the sporting groups are aggressive than the general population. Previous research with French athletes revealed similar results, where combat sports athletes' scores on total aggression were not significantly different than non-combat sports athletes (Reynes & Lorant, 2001). Even though results were consistent with previous research, some existing literature indicates that combat sports athletes scores low on total aggression than its counterpart (Bosson et al., 2009; Daniels & Thornton, 1992; Pasternak et al., 2020). Even though much of the existing literature is from European region, results of the study conducted in Iran by Ziaee et al. (2012), indicates the findings are agreeable in that, combat sports athletes are not aggressive than their counterparts. Results of the current study support the same idea - combat sports athletes are not aggressive than their counterparts in the Sri Lankan context. Hence it can be suggested that there are no cultural differences in aggression in sports.

It is evident that combat sports, by nature, require a certain degree of aggressive behaviour and those behaviours are encouraged in the day to day practice and competitions (Rogowska & Kuśnierz, 2013). There are occasions when participants are to witness aggression in sports and there are numerous ways these aggressive behaviours are being reinforced (Jarvis, 1999). According to social learning theory, these aggressive behaviours must make combat sports athletes more aggressive when compared to the non-aggressive sport. As suggested in the frustration-aggression hypothesis, frustration leads to anger, which might result in aggressive behaviour (Jarvis, 1999). All sports, including combat sports, require athletes to perform under pressure. More the competitive game is, more the pressure builds up and more the athlete gets frustrated. For an athlete to be successful in his or her sports career, the method of responding to such frustrations is a critical skill. This skill could be learnt from the practice of respective sport. Further, it is also possible that more aggressive practitioners got selected over a period of time due to the fact they respond to frustration through aggressive behaviour rather than being assertive. In combat sports, mistakes made in competitions are often rewarded with the pain of getting hit. This negative reinforcement can help to learn the skill of how to respond to frustration in a productive manner. Either way, an individual has to learn how to control aggressive behaviours in order to survive in the sporting field. Instinct theories in sports also provide a legitimate platform to express aggressive instincts while it is beneficial as it allows a release of one's frustrations (Jarvis, 1999).

Type of sports and physical aggression

The results of the independent measure MANOVA indicate no strong, significant difference between national level combat sports athletes and national level non-combat sports athletes in their physical aggression scores. A longitudinal study with French athletes by Reynes & Lorant (2004), revealed similar results, where combat sports athletes' scores on physical aggression were not significantly different than non-combat sports athletes. However, these findings are not consistent with the findings of Barczak et al. (2020), where it suggests higher levels of physical aggression in combat sports athletes though it is not in line with the majority of the research findings. The current study findings indicate that in the given sample, which was selected from the Sri Lankan athletes, the physical aggression levels are not significantly different.

Type of sports and Verbal aggression

Levels of verbal aggression between national level combat sports athletes and national level non-combat sports athletes has no significant difference according to the results of the independent measure MANOVA test. These findings are consistent with the available literature. Findings of both Barczak et al. (2020), and Reynes & Lorant (2004), shows similar

results that there is no significant difference of verbal aggression on the type of sports. The current study suggests that in Sri Lankan athletes, the verbal aggression levels are not significantly different.

Type of sports and Anger

The results of the independent measure MANOVA test indicate no significant difference between national level combat sports athletes and national level non-combat sports athletes in their anger scores. These findings are consistent with the findings of Barczak et al. (2020), where it shows no significant difference between the groups. Contrastingly, the findings of Reynes & Lorant (2004), indicates that combat sports athletes demonstrate higher levels of anger compared to non-combat sports athletes. Although there is a significant difference in anger difference between the groups according to the findings of Reynes & Lorant (2004), the total aggression levels show no difference. The current study findings indicate that in the given sample from the Sri Lankan athletes there exists no significant difference in levels of anger.

Type of sports and Hostility

Levels of hostility between national level combat sports athletes and national level non-combat sports athletes have no significant difference according to the results of the independent measure MANOVA test. These results are consistent with previous research findings where the findings of both Barczak et al. (2020), and Reynes & Lorant (2004), indicate that there is no significant difference of hostility in the type of sports.

Limitations and Recommendations for Future Research

The current study contains few limitations and one being not achieving the sample size as the method of data collection had to be changed to the online platform due to social limitations of COVID-19, the global pandemic. This can impact on the generalizability of the study. Another limitation is the unbalanced sex ratio; however, it is a better representation compared to the previous studies which has only male participants or extremely low female representatives. This is most likely because the sports preferences differ between women and men. Since the current study used a self-reported survey, social desirability bias might have occurred. The research used an anonymous self-completion format in order to discourage respondents from answering the questions in a manner that will be viewed favourably by others. A major value of the present study while laying the foundation of sports literature, is this study addresses the difference and of general combat sports and general non-combat sports without limiting the participants to several selected sports. On the other hand, it is a drawback that the study fails to collect important demographic data such as the sport practiced rather than collecting data on which group the participants are included in. These demographic data would have supported the further explanation of the findings.

As this was a cross-sectional study, reaching a definite conclusion is impossible; hence, future studies must be designed to consider the effect of motivation in the involvement in combat sports and martial arts as well as the motives for dropping out. A larger sample with a longitudinal study design can clarify the question of whether combat sports make practitioners more aggressive or less aggressive. To be specific, as the existing literature indicates differences among various combat sports and aggression levels, a study must be conducted using various combat sports in order to examine if there are any differences in various combat sports on aggression levels within the Sri Lankan context.

Conclusion

Though there are negative stereotypes concerning the perceived brutality of martial arts and combat sports, stating that combat sports make the practitioner more aggressive findings of the current study contradict with this popular opinion while it suggests that the type of sports practice has no effect on aggression. These findings can be used in debunking these negative stereotypes in order to educate and attract the sporting communities to practice combat sports.

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Original Article

Effectiveness of Acupuncture for Chronic Headache due to Perceived stress

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Abstract

The global prevalence of active headache disorders is estimated to be around 52%. The International Headache Society (IHS) defines chronic daily headache as, having 15 or more headache episodes per month consecutively for at least 3 months. Acupuncture is one of the most common alternative medicines used to treat chronic pain in patients. In Sri Lanka, there are no documented reports to evaluate the prevalence of headaches caused by perceived stress. Therefore, the current study aimed to assess the efficacy of acupuncture for chronic headaches caused by perceived stress in patients who visited the acupuncture clinic at KIU. Forty patients were selected using a convenient sampling method, and their stress levels were assessed using the Perceived Stress Scale (PSS). The Numeric Pain Rating Scale (NPRS) was used to assess the intensity of the headache prior to treatment. Following six weeks of acupuncture treatment, post-intervention PSS and NPRS were assessed. A strong positive correlation (r2=0.929, p=0.001) was determined between the levels of stress and the severity of headache. Furthermore, a statistically significant (p=0.001) decrease in means scores of stress and pain was found following acupuncture treatments. Therefore, it was concluded that acupuncture is an effective treatment method for chronic headache due to perceived stress.

Keywords: Chronic headache, perceived stress, Acupuncture

1. Introduction

Headache disorders are among the most common and disabling conditions in the world (Stovner et al., 2022), affecting individuals of all ages despite their gender, ethnicity, and socioeconomic status (Ahmed, 2012). The global prevalence of active headache disorders is estimated to be around 52% (Stovner et al., 2022). According to the International Headache Society, (2021), headaches are classified as primary and secondary headaches. Primary headaches are the most common type of headache which are migraine, tension-type headaches (TTH), and cluster headaches while secondary headaches are a manifestation of underlying disorders. Headache is usually regarded as a chronic disorder where one can experience acute episodes of pain which last for minutes to even days (Ahmed, 2012). The International Headache Society (IHS) defines chronic daily headaches (CDH) as "15 or more headache episodes per month for at least 3 months" (International Headache Society, 2021). Chronic headaches affect 1% to 4% of the entire population (Probyn et al., 2017), which accounts for around 39 million people in the United States and 1 billion people worldwide (Murphy & Hameed, 2021). Further, previous studies have highlighted that the prevalence rates of headaches in women are 3 to 5 times higher than in men (IHS, 2018).

Migraine and tension headaches have significant health, economic, and societal implications (Clarke et al., 1996). Despite medication's undeniable advantages, many patients continue to feel anguish and social disturbance. This encourages individuals to attempt, and health practitioners to recommend, non-pharmacological headache treatments (Vickers et al., 2004). Acupuncture is the technique of piercing the skin with needles at specific points on the body to treat or prevent various conditions and has been used for thousands of years by practitioners in many different cultures and societies around the world (Wu et al., 2013). Although it is used to treat a wide range of conditions, one of the most prevalent is the treatment of chronic pain (Vickers et al., 2012), particularly headache and migraine pain (WHO, 2003).

According to acupuncture constitutional traits, improper & unhealthy diet, trauma, excessive sexual activity, and emotional strain can be the etiological factors of headaches. Among these, emotional strain is the most widely spread factor which trouble individuals regardless of age (Nicholson et al, 2007). According to the World Health Organization, stress is the "health epidemic of the 21st century" and is one of the commonest triggers for migraine and tension type headaches (Stubberud et al., 2021). Similarly, young adults are mostly affected by emotional strain as they undergo busy and stressful lives more than the other age groups (Matos et al., 2021).

Hence, according to the principles of acupuncture, transformed migraine (TM), chronic tension-type headache (CTTH), and new daily persistent headache (NDPH) can be categorized as headaches from perceived stress type (Robbins and Crystal, 2010). However, in acupuncture, the manifestations are also treated primarily if the manifestations are severe and disturb the individual's daily life even if the treatment should mainly target the root cause of the ailment. However, during the process, the root cause is also treated simultaneously (Linde et al., 2009).

The most recent Cochrane systematic review update confirmed that acupuncture is effective for frequent episodic and chronic tension-type headaches with moderate to low-quality evidence (K et al., 2016). A brief review using all systematic reviews and metadata described acupuncture as having a 'potentially important role as part of a treatment plan for migraine, tension-type headache, and several different types of chronic headache disorders (Coeytaux & Befus, 2016). Studies in Germany and the UK have found that acupuncture for chronic headaches to be cost-effective (McDonald & Janz, 2017). Further, Ehler & Kraya, (2020)

evaluated the efficacy of acupuncture for migraine among children and adolescents. However, in Sri Lanka, no evidence-based research has been conducted up to date regarding the effectiveness of acupuncture treatment for headaches arising due to perceived stress. Therefore, the present study created a new approach to determine the effectiveness of acupuncture for emotional and subsequent headache which interrupts the day-to-day life of the adult population in Sri Lanka. These findings will justify the use of acupuncture as a successful remedy for headache with almost no side effects.

2. Methodology

2.1. Design and setting

A prospective case study was conducted among 40 patients who visited the acupuncture clinic at KIU Sri Lanka. The convenient sampling method was used to recruit the participants.

2.2. Ethical approval

Ethical approval for the study was obtained from the ethics review committee of KIU (ERC number KIU/ERC/21/165). Informed written consent was obtained from the participants prior to the study.

2.3. Data collection

A pre validated interviewer administered questionnaire was used to collect information from the participants which consisted of three sections. First section included questions to collect demographic data of the participants including age, gender, and occupation. The second section consisted of the “Perceived Stress Scale”(Cohen, 1994) to assess the levels of stress and the third section consisted of the “Numeric Pain Rating Scale”(McCaffery & Beebe, 1989) to assess the intensity of pain of the participants. The stress levels and the intensity of pain of the participants were assessed before and after the intervention. Pregnant and lactating women, those with existing neurological disorders, needle phobia, and patients who had a headache following trauma, injury, or brain infections were excluded from the study.

2.4. Intervention

Before the acupuncture interventions, the patients were asked to remove all metal objects (Jewellery, etc) on the body and confirm their fed state. The patients were then asked to sit on a chair and their skin was cleaned with alcohol (70% solution) at the location of the acupuncture points. Safety guidelines were followed for hand sanitization and stainless-steel acupuncture needles (Size- 0.25×25mm) were inserted into the selected acupuncture points by a well-trained acupuncture practitioner. Needle insertion procedures took about 3- 5 minutes. Needles were left for 20-30 minutes. The acupuncture points used for each patient were Yuyao (EX3), Yangbai (GB14), Yintang (EX1), Taichong (LIV3), Fengchi (GB20), Waiguan (SJ5), Taixi (K3), Zhaohai (K6), Hegu (LI 4), Shenmen HT 7, Neiguan PC 6 (Figure 1) which included local as well as points addressing the patient’s underlying disharmony.

This was done four times a week for six weeks. During the treatment, participants were provided with proper emotional advice, dietary modifications, and consummatory behaviors by the acupuncture practitioners.

2.5. Data analysis

The data were analyzed in SPSS; IBM (version 25) using descriptive statistics, including means, standard deviations, frequencies, and percentages. Pearson’s correlation and chi-square was used to determine the nature and significance of the relationship between the level of stress and the intensity of pain. Paired sample t-test was used to compare the difference of pre and post intervention level of stress and pain.

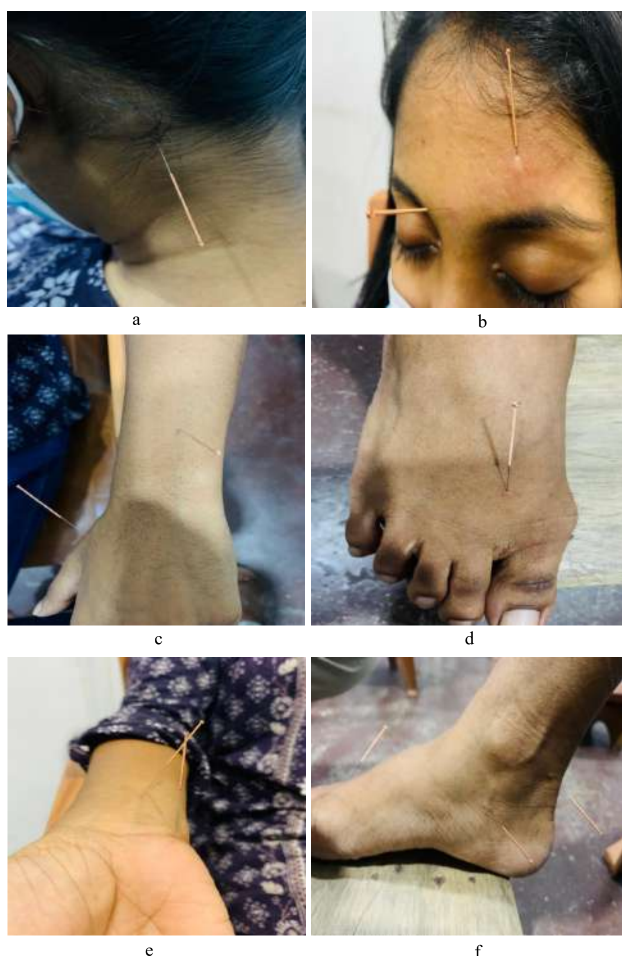

Figure 1. Acupuncture points used in the present study. a. Fengchi (GB20);b. Yintang (EX 1), Yangbai (GB 14) and Yuyao (EX 3); c. Waiguan (SJ 5), Hegu (LI 4); d. Taichong (LV3); e. Shenmen (HT 7), Neiguan (PC 6); f. Taixi (K 3), Zhaohai (K 6)

3. Results

3.1 Demographic characteristics of the study population

According to the present study population, majority (n=25; 62.5%) were females while 37.5% (n=15) were males. Age of the study sample ranged from 15-48 years with a mean age of 28 years. The majority of the respondents were employed (n= 16, 40%) while 27.5% (n=11) were unemployed and 32.5 % (n=13) were students. In the present study population, 70% (n=28) of the respondents were Muslims while 22.5% (n=9) were Sinhalese and 7.5% (n=3) were Tamils. Majority of the study participants were married (n=21, 52.5%) while 40% (n=16) were unmarried (Table 1).

Table 1. Socio-demographic characteristics

		Frequency	Percentage
Gender	Male	15	37.5%
	Female	25	62.5%
Occupation	Employed	16	40.0%
	Unemployed	11	27.5%
	Students	13	32.5%
Ethnicity	Sinhala	9	22.5%
	Tamil	3	7.5%
	Muslim	28	70.0%
Civil status	Married	21	52.5%
	Unmarried	19	47.5%

3.2. Pre-intervention level of stress & intensity of pain

Pre-intervention study results showed that majority of the study participants were suffering from higher levels of stress (n=23, 57.5%) while 37.5% (n=15) were suffering from moderate stress and only 5% (n=2) of the participants had low stress levels. Further, according to the results of pre intervention level of intensity of pain, majority of the participants (n=36, 90%) were observed to be suffering from severe pain and 10% (n=4) of the participants were suffering from moderate pain (Table 2).

Table 2. Pre-intervention level of stress & intensity of pain

Level of stress	N	%
High Stress	23	57.5
Low Stress	2	5.0
Moderate Stress	15	37.5
Level of intensity of pain		
Mild pain	0	0.0
Moderate pain	4	10.0
No pain	0	0.0
Severe pain	36	90

Concerning the association between level of stress and severity of pain, the present study revealed that the majority (57.5; n=23) of the participants who possessed higher levels of stress was suffering from severe pain levels due to headache, while thirteen (n=13) of the participants with moderate levels of stress were observed to be suffering from severe headache (Table 3). Further, the pearson chi -square test revealed that there was a statistically significant association (p=0.001) between level of stress and severity of pain.

Table 3. Association between level of stress and severity of pain

	Moderate Pain	Severe Pain
High Stress	0	23
Low Stress	2	0
Moderate Stress	2	13

Interestingly, there was a strong positive correlation (r^2=0.929, p=0.001) between the level of stress and severity of headache among the participants as analyzed by the pearson's correlation (figure 2).

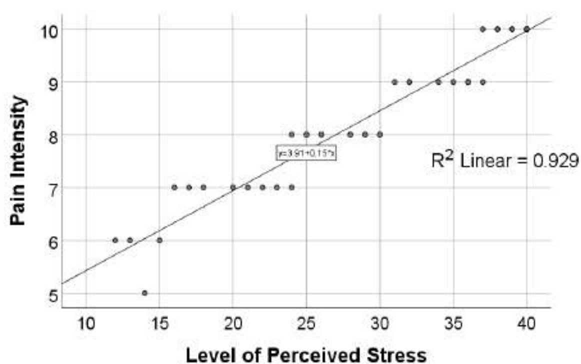

Figure 2. Relationship between level of stress and pain intensity

3.3. Post intervention level of stress & intensity of pain

According to the post intervention study results, the majority (n=34,85%) of the study participants possessed low levels of stress after the acupuncture treatment, while 6 (15%) of the participants possessed moderate stress level. In assessing the levels of intensity of pain among the study participants after the acupuncture treatment, it was revealed that majority of the participants (80%, n=32) experienced no pain after the treatment, while 12.5% (n=5) and 7.5% (n=3) of participants experienced moderate and mild pain respectively (Table 4).

Table 4. post-intervention level of stress

Level of stress	N	%
High Stress	0	0.0
Moderate Stress	6	15.0
Low Stress	34	85.0
Level of intensity of pain		
No pain	32	80.0
Mild pain	5	12.5
Moderate pain	3	7.5

3.4. Comparison of pre- and post-intervention level of stress and intensity of pain

As shown in figure 3, the level of stress is reduced after six weeks of acupuncture treatment compared to the pre-intervention stress. Further, a paired sample t-test analysis revealed that there was a reduction in the pre-intervention mean stress score of 28.48 ± 8.590 than the post-intervention mean stress score of 9.75 ± 3.028 with a significant difference observed before and after the acupuncture treatment; t(39) =16.783, p=0.001.

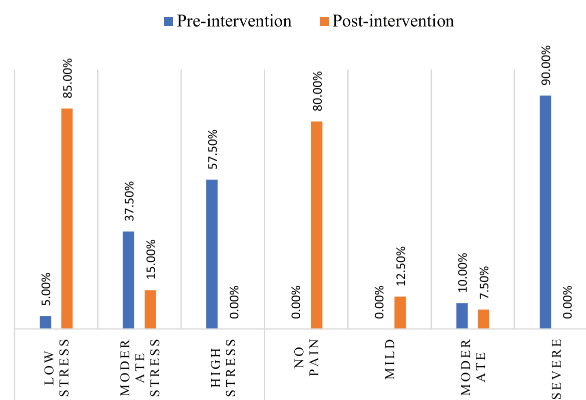

Figure 3. Pre- and post-intervention level of stress and intensity of pain

Similarly, the level of intensity of pain was reduced after six weeks of acupuncture treatment from severe to no pain (Figure 3). Moreover, a paired sample t-test confirmed that the reduction of mean pain score before (8.23 ± 1.349) and after the treatment (0.75±1.565) was significantly different in pre intervention and post intervention mean score of pain; t(39)=34.800, p=0.001.

4 Discussion

As observed in this study, majority of the participants were females. The fact that the vast majority of the research participants were female is most likely due to the fact that headaches, especially migraine, are more common in women than men (Lipton et al., 2001; Melchart et al., 2006). Secondly, there is consistent evidence that women are more prone to seek complementary therapies (Melchart et al., 2006; Thomas et al., 1991).

A study conducted by Kelman showed that stressful life events were a risk factor for the development of chronic headaches. Further, stress is also the commonest trigger for acute episodes of chronic headaches as reported by patients (Kelman, 2007; Stubberud et al., 2021). The result of the current study showed that the majority of the study participants had higher levels of stress during the pre-intervention while 37.5% showed moderate stress and only 5% of the participants had low stress levels. The study also reported that the majority were observed to be suffering from severe headache and 10% of the participants were suffering from moderate pain. The results of the present study further revealed that that there was a statistically significant association between level of stress and intensity of pain. Further, the study revealed that the levels of stress among the participants and the intensity of headache had a strong positive correlation. These results are in accordance with some of the previous studies conducted. Schramm et al, in a prospective study with over 5000 participants observed that the level of stress was associated with headaches in those who had tension-type headache, migraine, or both tension-type headache and migraine (Schramm et al., 2015). Similarly, some observational studies also showed an association between stress and migraine symptom burden. It was also noted in a study by Santos et al, that there is an association between the increase risk of migraine due to high job stress, which results in less time for personal care and recreation (An et al., 2019; Santos et al., 2014; Stubberud et al., 2021).

The current study indicated that majority of the study participants had low levels of stress after the post intervention while 6 participants had moderate stress level, post intervention. It was also revealed that when assessing the levels of intensity of pain among the study participants, the majority of the participants experienced no pain post intervention, while only 3 participants experienced mild pain and 5 participants experienced from moderate pain, post intervention. As per the analysis of the results, both the intensity of pain and the levels of stress were significantly reduced after the treatment. In a study conducted in Germany enrolling 2022 patients (732 with migraine, 351 with episodic and 440 with chronic tension type headache, and 499 with other) showed that there was a significant ($P < .001$) improvement in all the outcome measures (Average pain, pain disability index [PDI], Depressive symptoms [ADS], Restricted physical health [SF-36], and Restricted mental health [SF-36]) in all diagnostic subgroups after completion of acupuncture sessions (Melchart et al., 2006).

A randomized controlled trial conducted by Vickers et al., (2004) to determine the effects of acupuncture for chronic headaches (predominantly migraine) revealed that the headache score after 12 months of acupuncture treatment was lower in the acupuncture group than in the control group who received standard care from general practitioners (Vickers et al., 2004). In yet another study done in 2020, Liao et al., reported that 21,209 patients with migraine were treated successfully with acupuncture. Further, this study reports a lower medical expenditure within year of treatment intervention, a low depression risk and a low anxiety risk when compared to the non-acupuncture cohort (Liao et al., 2020). Furthermore, a study conducted in Germany reported that after 3 months of acupuncture treatment, the number of days with headache in patients decreased from 8.4 ± 7.2 (estimated mean ± S.E.) to 4.7 ± 5.6 in the acupuncture group and from 8.1 ± 6.8 to 7.5 ± 6.3 in the control group ($P < 0.001$). It should be also noted that the improvements in the intensity

of pain and quality of life were more prominent in the acupuncture vs. control group (P < 0.001) (Jena et al., 2008).

Further investigation is required to determine if acupuncture should be studied as part of a multimodal headache care regimen. Studies must also be conducted to determine the best time to provide acupuncture, the best acupoints to use, and the best frequency of acupuncture therapy.

5. Conclusion

Perceived stress was a critical factor for chronic headaches. Acupuncture interventions were found to be useful for the management of chronic headaches due to perceived stress.

6. Conflict of interest

There are no conflicts of interest.

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Review Article

Is Stomach a Sterile Environment?

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Abstract

The stomach is considered a sterile organ for a long time due to anatomical and physiological features, till the discovery of *Helicobacter pylori* in 1982, which demolished the conception of sterile stomach. The pathogenicity of *Helicobacter pylori* is enhanced by several virulence factors. Initially, with the aid of culture-based techniques which were later followed by advanced culture-independent molecular techniques, whereby the complexity and biodiversity of gastric microbiota were revealed. Commensals, as well as pathogenic microbes have developed mechanisms to ensure successful colonization in the gastric environment. A number of published literature suggests the correlation of these bacteria with gastric diseases including gastric cancer and peptic ulcer disease as well as the beneficial relationships like probiotics. This review summarizes current information on the correlation of complexity and diversity of gastric microbiota and host in health and disease.

Keywords: Stomach, *Helicobacter pylori,* Gastric cancer, Gastric microbiota

Introduction

The stomach is a unique environment with many anatomical and physiological adaptations for its functions of mechanical digestion and initiation of chemical digestion of protein components of food. This organ was considered as a sterile organ for a long period of time. This long prevailed scientific dogma was demolished by the discovery of *Helicobacter pylori* (*H. pylori*) in 1982. For several years, it was considered that only this bacterium could survive in the gastric environment. However, the recent advancement of culture-based techniques as well as culture-independent molecular techniques made provisions for the available knowledge on the complexity and the diversity of the gastric microbiome.

The complexity and diversity of microbiota are indicated by the presence of 10-100 trillion microbial cells throughout the human body.[1] The knowledge of gastric microbiota is indispensable in understanding the pathogenesis, diagnosis, and treatment of gastric pathologies. This article reviews the current knowledge on human gastric microbiota, highlighting the correlation between structural and functional adaptations of microbiota and gastric diseases.

Anatomical and physiological factors that help to maintain sterility in the stomach

The hostile surrounding of the stomach created by low pH, gastric rugae, peristalsis, mucus thickness and bile acid reflux, was thought to be inhibiting the colonization of microbes.

Gastric acid is a major factor that contributes to the gastric bactericidal barrier which plays a vital role in the digestion of food in the stomach by creating a low pH environment within the range of pH 1.5 to 3.5. In 1972, an in-vitro study was conducted on the bactericidal activity of normal gastric juice, which revealed that at pH less than 4.0, 99.9 % of the bacteria get killed within a period of 30 minutes.[2]

Gastric rugae are coiled tissue sections in mucosa and submucosa in the stomach that contribute to the antibacterial environment of the stomach. A study conducted in 2010 suggests that gastric infections affect the integrity of gastric folds. In this study, 36 equine stomachs were examined for lesions caused by bacterial infections. Hyperplastic rugae were observed in 13 stomachs in this study and intracellularly Escherichia-like bacteria had been observed. This bacterial species was *Escherichia fergusonii* which is an emerging pathogen in both humans and animals.[3] Gastric peristalsis contributes to the sterility of the stomach by the mechanical removal of microbes with the aid of muscle movements. An experiment conducted on the elimination of *Vibrio cholerae (V. cholerae)* from the gastrointestinal tract of adult mice revealed the effect of peristalsis on the elimination of *V. cholerae* by varying the factors affecting peristalsis. This study depicted that the rapid removal of microorganisms by peristalsis has a significant effect on the reduction of a viable number of microorganisms.[4]

Bile acids are biological detergents that facilitate emulsification and solubilization of dietary lipids and also display potent antimicrobial activity as the bacterial membranes become their main targets. De Valdez, using electron microscopy revealed that strains of *Lactobacillus reuteri* exposed to bile showed severe distortion of the cell envelope and membrane alterations that presented folds and buds.[5]

Helicobacter pylori

The unexpected discovery of *H. pylori* was a remarkable finding in the history of microbiology. In 1982, Warren and Marshall observed flagellated, spiral or curved bacilli in biopsy specimens from antral mucosa. This Gram-negative, flagellated, and microaerophilic bacterium was initially named as *Campylobacter pyloridis* by Warren and Marshall due to its close resemblance to the genus *Campylobacter* in respect of atmospheric requirements and DNA base composition. However, their

flagellar morphology is not that of the genus *Campylobacter*.[6] Hence in 1984, the bacterium was renamed as *Helicobacter pylori* by the two scientists. For this revolutionizing discovery that changed the perspective of gastric pathologies, Warren and Marshall received the Nobel Prize in Physiology or Medicine in 2005.

Survival Mechanism of *Helicobacter pylori*

H. pylori possesses unique characteristics that aid in the 3 major pathogenic processes, including colonization, immune escape, and disease induction. Motility, urease production and adhesion factors help the bacteria to penetrate, colonize and survive in unfavorable highly acidic gastric environment. The motility of *H. pylori* is conferred by two to six sheathed unipolar flagella that extend 3-5 µm from the bacterial surface, with bulb-like structures often seen at the tip of the filaments. In 1996, a study was conducted to determine if one or both flagellin genes, FlaA and FlaB are necessary for colonization or persistence by *H. pylori* in gnotobiotic piglets. It was observed that non-motile mutants lacking flagella were unable to establish persistent infection in the animal model used.[7]

Urease enzyme helps the bacterium to resist gastric elimination effectively by neutralizing the extreme acidity. The role of urease in the pathogenesis of gastritis induced by *H. pylori* was experimented using gnotobiotic piglets, which revealed that *H. pylori* survives at a pH range between 4.0 and 8.0 in the absence of urea. However, in the presence of urea the organism can survive at a pH as low as 2.5.[8]

Several outer membrane proteins (Hop proteins) of *H. pylori* have been identified as adhesion factors, which facilitate the adherence of the bacterium to the gastric epithelium. These include proteins like BabA, SabA, OipA, AlpA, AlpB etc. The mechanism of adhesion factors in pathogenicity of *H. pylori* infection is still not fully understood. A study conducted in 2011 revealed that *H. pylori* strains expressing low levels of BabA contributed to more severe mucosal injury and were more frequently associated with duodenal ulcer and gastric cancer than strains with a high-level expression of BabA or those lacking the BabA gene.[9]

Once established, *H. pylori* expresses virulent proteins such as Cytotoxin-associated gene A (CagA) and Vacuolating cytotoxin A (VacA) that control the host's immune system to escape immune detection and allow its persistence in the human stomach.

Non-*H. pylori* Organisms

Over 3 decades it was believed that only *H. pylori* was able to survive the hostile gastric environment. But further investigations revealed the complexity of microbial community residing in association with the stomach and the duodenum. These investigations discovered that in addition to *H. pylori*, there are non-pylori Helicobacter bacterial strains as well as non-Helicobacter strains in the stomach. Prior to the discovery of *H. pylori*, a report published in 'The Lancet' in 1981 revealed the presence of several acid-resistant bacterial strains in the stomach. These included *Streptococcus, Neisseria,* and *Lactobacillus*.[10] Since the discovery of *H. pylori*, over 20 species of *Helicobacter* have been officially recognized through many studies.

In 2006, Bik et al. used a small subunit 16S rDNA clone library approach to study the bacterial diversity within the human gastric mucosa, by analyzing gastric biopsy samples of 23 individuals. It was observed that *H. pylori*, the only member of the genus Helicobacter constituted 42% of all sequences analyzed. Subsequent to *H. pylori*, *Streptococcus* sp. (299 clones) and *Prevotella* sp. (139 clones) were observed as the most abundant species.[11]

A study conducted in 2013 used culturing and pyrosequencing of gastric juice and biopsy specimens of 12 healthy individuals revealed that Streptococcus, Propionibacterium and Lactobacillus were the most abundant genera

among gastric microbiota.[12]

In 2014, Khosravi et. al studied culturable bacteria in the stomach among a large population of 215 Malaysian patients referred for endoscopy and revealed that Actinobacteria, Proteobacteria, Firmicutes, and Bacteroidetes are the major phyla in human gastric microbiota.[13]

There is limited data available on diversity of gastric microbiota among Sri Lankan population. Previous studies conducted on the prevalence of *H. pylori* among Sri Lankan dyspeptic patients showed a low prevalence due to low sensitivity of methods used.[14] However, in 2002, Fernando et al. using PCR, observed that there was 75.4% prevalence of *H. pylori* among 57 Sinhalese dyspeptic pateints.[14]

A recent study conducted in Sri Lanka, has identified yeast species and bacteria (including *H. pylori*) in the gastric mucosa of patients with dyspepsia. The same study reported that out of 70 gastric biopsy specimens, yeast was found in 10 specimens while bacterial species were found in 65 specimens. Also, the study reported 14 cases of *H. pylori* infection by doing a rapid identification test (IBUT) and histological examination.[15]

In the same study, bacterial DNA when subjected to Denaturing Gradient Gel Electrophoresis (DGGE), reported multiple bands in a single specimen suggesting the presence of multiple species in the gastric mucosa in patients with dyspepsia. Further interestingly, through DGGE and band sequencing techniques it was found that most of the yeast species found in gastric mucosa were *Candida albicans*. [personnel communication and unpublished data]

Techniques Associated with Discovery of Gastric Microbiota

Culture Based Techniques

In early years, the identification process of bacteria was solely dependent on culture-based techniques. These methods have paved the way to many important investigations such as identification of bacterial diversity of the stomach. Mucosal biopsy and gastric juice specimens were mostly used for culturing. Studying gastric juice alone can lead the investigator to underestimate the diversity of bacterial microbiota in the stomach as it does not calculate the inhabitants of mucosal membrane. Furthermore, the identification of bacterial strains by conventional culture-based methods provides an incomplete and biased picture of the biodiversity of gastric microbiota, as more than 80% of microorganisms are uncultivable.[16] However, it has been argued that culture-based techniques provide an advantage over molecular methods in distinguishing viable microorganisms.[16]

Culture Independent Molecular Techniques

To overcome disadvantages of culture-based technologies, culture-independent molecular methods based on 16S rRNA gene became effective[12]. Among the molecular based studies dot-blot hybridization with rRNA targeted probes, targeted qPCR fluorescent in situ hybridization (FISH), traditional or sequence-aided community fingerprinting including denaturing gradient gel electrophoresis (DGGE), temperature gradient gel electrophoresis (TGGE) ,terminal restriction fragment length polymorphism (T-RFLP), sequencing of cloned 16S rDNA, microarrays (PhyloChip) and next-generation sequencing (NGS) have been used to determine the diversity of gastric microbiota.[12]

Disease Associated with Gastric Microbiota

Chronic Gastritis

H. pylori infections produce various degrees of chronic inflammation in gastric mucosa. Several studies suggest that *H. pylori* colonization leads to formation of mucosa-associated lymphoid tissue lymphomas (MALTomas) and aggregation of polymorphonuclear leucocytes. This leads to histological changes compatible with gastritis. In 2009, Li et al. revealed that the over-

representation of the *Streptococcus* genus within the Firmicutes phylum, can lead to histological change of gastritis of the stomach, even in the absence of *H. pylori*.[17] This indicates the role of other microbiota in gastroduodenal diseases.

Peptic Ulcer Disease

Peptic ulcer disease can be considered as a complication of chronic *H. pylori* infection. Genetic variability and diverse virulence factors such as CagA and VacA can determine various levels of risk for duodenal or gastric peptic ulcers.[18] Loss of parietal cells effects in decreased gastric acid output creates a favorable environment, allowing the other microbial communities to colonize. In 2014, Khosravi et al. demonstrated a significant correlation between the isolation of *Streptococci* and peptic ulcer disease.[13] Accordingly, non-*H. pylori* bacteria may also play a vital role in the pathogenesis of gastroduodenal diseases.

Gastric Cancer

H. pylori is considered to be a fundamental cause of most gastric malignancies. In a prospective cohort study conducted in 2007 using 1,225 dyspeptic Taiwanese, among which 618 were *H. pylori* infected, it was concluded that *H. pylori* infected patients are more susceptible to develop gastric malignancies, including adenocarcinoma and lymphoma.[19] Furthermore, World Health Organization (WHO) has classified *H. pylori* as a carcinogen. In 1994, the International Agency for Research on Cancer (IARC), a subordinate organization of the WHO, identified *H. pylori* as a 'group 1 (definite carcinogen)' based on the results of epidemiologic studies.[20]

Other Infections

It has been proved by many studies that acute gastrointestinal infections can activate irritable bowel syndrome.[21] The correlation between the gastroduodenal microbiota and colonic neoplasia has been studied worldwide. In 2012, Zhang et al. observed that among patients with colorectal cancer *H. pylori* infection was more prevalent than among controls.[22]

Mechanism of Colonization of Gastric Microbiota

Nutrients

The colonization of species is diverse according to their metabolism in the gut. The colonization ability of gut bacteria is determined by the ability to utilize a specific nutrient which can be a limiting factor. In 2013, a study conducted using gnotobiotic mice identified commensal colonization factors (CCFs) which are bacterial species-specific carbohydrate utilization systems, in *Bacteroides vulgatus* and *Bacteroides fragilis.* The bacteria are capable of colonizing in suitable nutrient niches with the aid of CCFs.[23]

Mucus and Adherence

In the gut, both commensals and pathogens, to colonize should reach epithelium by overcoming the mucosal barrier and the immune system. The bacterial motility is restricted by flagellin which is immunogenic as it is a ligand for Toll-like Receptor 5 (TLR5). The other limiting factor of bacterial motility is the viscosity of mucus. A study conducted in 2010 revealed that *Shigella flexneri* and *E. coli* have developed a strategy of secreting Pic, a mucin-binding serine protease that rapidly digests mucus. Furthermore, this protein interferes with the ability of indigenous bacteria to compete with the pathogen by stimulating hypersecretion of mucus.[24]

Antimicrobials

Paneth cells, a specialized immune cell type lying at the base of the crypts of the small intestine with the ability of secreting cationic antimicrobial peptides which restrict the growth of bacteria in the mucosal surface. Several Gram-negative pathogens have developed modifications in lipid A, a major component of the outer membrane in order to develop resistance against antimicrobials. A study showed that a modification in lipid A of

H. pylori by under phosphorylation, was found to be important for resilient colonization by *Bacteriodes thetaiotaomicron* in inflammation.[25]

Factors Affecting Diversity of Gastric Microbiota

Socio-demographic factors including age, gender, ethnicity, and dietary behaviors can influence the diversity of gastric microbiota.[26] It has being observed that the microbiota undergoes considerable changes in infants and older people.[27] In the elderly population, it was observed that changes in the composition of Firmicutes and increases in the proportion of Bacteroidetes.[27]

The correlation of gastric microbiota with gender was revealed in several studies. In 2006, a cross-sectional study on the composition of gut microbiota among 230 European subjects suggested that gender affects the distribution of microbiota, with the observation of males having higher levels of the *Bacteroides-Prevotella* group than females.[28]

When considering the effect of ethnicity on the diversity of gastric microbiota, a comparative study conducted by evaluating the fecal microbiota between different geographic locations or different ethnic groups has found large variation in specific bacterial groups.[29]

Dietary patterns and diet composition are believed to strongly influence the diversity of gut microbiota. The correlation of gastric microbiota composition with diet and health was studied among 178 elderly subjects. It was observed that the abundance of short-chain fatty acid producing bacteria is affected by the quality and diversity of the diet.[27]

Plant materials used as herbs and spices in processing food can affect the diversity of gut microbes. A study conducted on bactericidal and antiadhesive properties of 25 culinary and medicinal plants against *H.pylori,* demonstrated that turmeric was observed the most efficient in killing *H.pylori* which is followed by cumin, ginger, chili, borage, black caraway, oregano and liquorice. Furthermore, it was observed that extracts of turmeric, borage, and parsley were able to inhibit the adhesion of *H pylori* strains to the stomach sections.[30]

Health Benefits of Gut Microbiota

Despite the presence of pathogenic gut microbiota, there can be beneficial commensals that help in the physiological processes of the host and prevent colonization of pathogenic organisms like *Candida spp*. that has been detected in stomach. However, it has been observed that *Lactobacillus sp*. can inhibit such pathogens.[26] Hence Lactobacilli can be used as probiotic to manufacture dairy products preventing *H.pylori* infection.

The roles of the gut microbiota in resisting the colonization of enteric pathogens, promoting the maturation of the host immune system, and host metabolism, as depicted by many studies in the past years, provide an explanation to mechanisms underlying the vast supportive roles of the gut microbiota in human health. The ability of gut commensals to inhibit pathogen colonization is mediated via several mechanisms including direct killing, competition for limited nutrients, and enhancement of immune responses. A study conducted in 2014 reported the occurrence of innate immune defects in germ-free mice resulting from the absence of gut microbiota. It was observed that recolonization of germ-free mice with a complex microbiota restores the immune defects and develops resistance to systemic infection with *Listeria monocytogenes*.[13]

Summary

The discovery of *H. pylori* demolished the scientific dogma that ‘the stomach is a sterile organ’. Several studies suggest that the healthy human stomach holds a core microbiome including *Prevotella*, *Streptococcus*, *Veillonella*, and *Haemophilus*. The adaptations to neutralize acidity, overcome mucus barrier, and ability to

escape the host's immunity enable the survival and colonization of gastric microbiota. It was evident that microbial interactions influence an individual's risk of gastric diseases, including gastric cancer.

Further, studies on the composition of gastric microbiome and their role in health and disease are required to address the variations of bacterial diversity in the extremely acidic environment. Changes in gastric acidity and the use of probiotic or antibiotic therapies need to be attentively analyzed for their effect on the structure and function of the gastric microbiome. There could be many other mechanisms of the gut microbiota in causing the host systemic infections that are yet to be discovered.

Conclusion

Gastric microbiota plays a vital role in the development of gastric disorders. Further studies on complexity and diversity of gastric microbes will benefit in clear understanding of their correlation with health and disease. The available knowledge on this topic is confined to a few species. In addition to individual pathogenic species, microbes can act synergistically to develop diseases.

Conflict of Interest

The authors have no conflict of interest to declare

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Original Article

Sources of Second Language Speaking Anxiety: An Investigation into the Lecturers' Perspective

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Abstract

'Anxiety' experienced in speaking English as a second language has been a topic of much interest in the field of language learning as it is debilitating and it creates an impact on the achievement of the language learners in an adverse manner. This nervousness or anxiety seems to be inducing when the students are asked to speak in the second language in the class. Presumably, speaking has become a complete fallout in acquiring the language. Thus, it was of paramount importance to embark in a research on this circumstance with the aim of investigating the perspectives of the lecturers in order to integrate students into an English speaking environment with greater ease and to increase the students' enjoyment when learning and communicating in English. To accomplish the objectives of this study, a total of 40 academics from the Faculty of Social Sciences & Languages, Sabaragamuwa University of Sri Lanka were selected. The data gathered were analyzed through a mixed approach which consisted of both qualitative and quantitative data analyzing methods using descriptive statistics such as frequencies and percentages. A total of 40 academics participated in the study. The majority of the participants were females (92.5%), aged between 31- 40 years (52.5%) with 3-5 years of working experience (47.5%). The responses revealed some intriguing findings and three categories of possible sources for second language speaking anxiety were explored as psychological, methodological and social. It was distinct through the lecturers' perspectives, that psychological causes of speaking fears could stem from the lack of self-confidence, low esteem, fear of failing the subject, fear of negative evaluation, the need to be perfect & accurate and previous negative experiences. It was also apparent that the instructional methods employed in the classroom such as anxiety-ridden classrooms, monotonous teaching style, competition within the classroom, boring topics and activities evaluations and grades as well as social causes such as public embarrassment, negative judgement from teachers and students, unhealthy relationship with peers and isolation will contribute to second language speaking anxiety. Hence, this study can be taken as a reference for the lecturers in determining the possible sources of second language speaking anxiety. Thereby, to decide on the effective strategies that can be employed in order to alleviate the speaking anxiety of the students. The findings also pave the path for the lecturers to realize their own reactions that can possibly enhance or lessen the speaking anxiety of the students.

Keywords: English as a Second Language (ESL), Lecturer perspective, Speaking anxiety

Introduction

When scrutinizing the situation of the English speaking proficiency in the Faculty of Social Sciences and Languages, Sabaragamuwa University of Sri Lanka, it was noticed that there was a substantial number of undergraduates who demonstrated worse performances in speaking the Second Language. Most of the undergraduates exhibited nervousness. They were not eager to respond voluntarily and were not confident enough to initiate conversations in the class room in English. Besides, although the syllabus and teaching methods of the subject have periodically been changed, the students' performance especially the speaking has been drastically deteriorating. It was significant that this matter has adverse effects on students, especially when presenting in front of the class. They seemed to lose confidence during oral assignments and some of the symptoms such as 'minds going blank', 'freezing when spoken to', 'hoping to avoid being called on in class', absence in English lectures could be noticed.

In order to bridge this aforementioned gap and to diminish the anxiety of students in speaking English, the necessity of determining the underlying causes of speaking anxiety were highlighted. Prior research conducted on the subject suggest that the teacher must give them ample opportunity for purposeful communication through meaningful strategies in order to diminish speaking anxiety. Therefore, lately there has been a switch towards the communicative approach and student-centered learning in education where the teachers furnished themselves with innovative pedagogic skills and practices, deviating from traditional methods of teaching. Although group work, pair work and mingling activities are constantly deployed to achieve the Intended Learning Outcome (ILO), the phenomenon of speaking anxiety still continued to affect the ESL learners in an unfavourable manner, especially during their oral assignments.

Besides, by probing the lecturers' perspectives, it was also expected to accentuate the role of teacher in the ESL context which is much more than executing lesson plans. In that way, teachers can be a constant positive motivation for the students, particularly for those who are unwilling to speak and are anxious in the classroom. Engaging in the teaching-learning process actively with the maintenance of a good rapport with the lecturer and fellow students in furthering knowledge, producing a self-assured, fluent undergraduate with a good command in English were considered significant to facilitate this focus. Thus, it was of paramount importance to embark a research on this circumstance with the aim of investigating the perspectives of the lecturers in order to integrate students into an English speaking environment with greater ease and to increase the students' enjoyment when learning and communicating in English.

Methodology

To accomplish the objectives of this study, a total of 40 academics from selected departments who were conducting lectures for the first-year undergraduates of the Faculty of Social Sciences and Languages, Sabaragamuwa University of Sri Lanka were chosen. The study took place in the academic year of 2017/2018.

In terms of the data collection, both primary and secondary data collection methods were employed. A questionnaire was utilized as the primary source of data collection consisting of closed ended questions and open-ended questions. All the participants were asked to answer all the items in the questionnaire and were provided with a sufficient amount of time to complete them. With regard to the format of the questionnaire, it is noteworthy that every question was constructed to scout the sources of speaking anxiety of students from the lecturers' stand points. The questionnaire consisted of two parts; first part of the questionnaire was focused on gathering demographic data whereas the second part was concerning the sources of Second Language Speaking anxiety.

Interviews were used as another instrument of the data collection process. A semi structured interviews were administered to all the lecturers in the sample of interest who were conducting lectures for first year undergraduates at the Faculty of Social Sciences and Languages in order to prospect the profiles of an effective teacher and to unfold their perceptions towards Second Language speaking anxiety. In the light of the responses of the interviewee, additional questions were asked for the clarification of any misinterpretations of the questions that may have arisen during the interview. With regard to the format of the semi-structured interview, all questions were constructed in comprehensive language to best reflect the participants' experience on speaking anxiety and to paint the actual picture related to the speaking anxiety. The interviews were vital to get responses related to the lecturers' standpoint and to follow up the avenue of interest that cropped up during the interview sessions. It was expected to traverse the first-hand experiences of lecturers with regard to the reluctance of students in speaking the target language and to determine the ways of striving against this reluctance. Thus, it was intended to range over the knowledge of the academic staff in confronting the learner anxiety in speaking.

With regard to the method of data analysis, both quantitative and qualitative data analyzing methods were utilized. Initially, the responses retrieved for the close-ended questions in the questionnaire were analyzed quantitatively with regard to the fulfillment of the objectives of the research and the open-ended questions were analyzed in a qualitative manner. Data was analyzed using descriptive statistics such as frequencies and percentages. Interesting findings were depicted using appropriate tables and graphs. SPSS version 25 was used as the data analyzing tool.

Results

A total of 40 academics participated in the study. The majority of participants were females (92.5%, n=37), aged between 31-40 years (52.5%, n=21) with 3-5 years of working experience (47.5%, n=19). 7.5% (n=3) of the total population was males with over 3 years of experience. Majority of the participants (55%,n=22) who engaged in the study held the position of Lecturer (Probationary). 22.5% (n=9) of Senior Lecturers were also involved in the study. The participants were selected from four departments in the Faculty of Social Sciences & Languages, Sabaragamuwa University of Sri Lanka. Majority of them (32.5%, n=13) were representatives from the Department of English Language Teaching as it was expected to scout the profiles of an effective language teacher. The rest of the participants represented the departments of Languages, Sociology and Political Science. It was significant that, 32.5%, (n=13) of the total sample engaged in teaching English, whereas 20% (n=8) were teaching translation studies. The percentage of lecturers who were teaching German language was 5% (n=2) whereas, 22.5% (n=9) were teaching Sociology and 20% (n=8) were engaging in teaching Political science. Yet, all the participants were conducting lectures in the English medium. (Table 01)

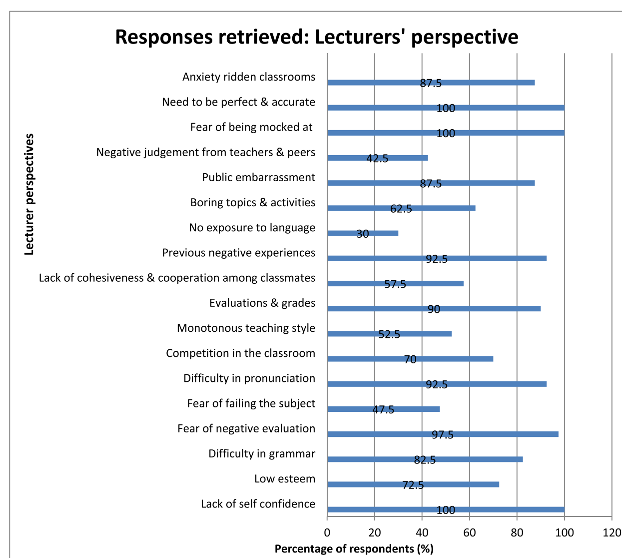
Table 01: Sociodemographic information of the participants

Characteristics	Frequency	Percentage
Gender		
Female	37	92.5
Male	03	7.5
Age		
20-30	12	30
31-40	21	52.5
41-50	07	17.5
Designation		
Instructor	03	7.5
Assistant Lecturer	06	15
Lecturer (Probationary)	22	55
Senior Lecturer	09	22.5
Department		
English Language Teaching	13	32.5
Languages	10	25
Sociology	09	22.5
Political Science	08	20
Areas of teaching		
English	13	32.5
Translation studies	08	20
German	02	5
Sociology	09	22.5
Political Science	08	20
Years of experience		
1-3	14	35
4-6	19	47.5
More than 7	07	17.5

Results

In order to be well defined and comprehensible, the data accumulated with the use of questionnaire and the semi-structured interview were presented accordingly using a bar graph (Figure 01), pinpointing the lecturers' perspectives on speaking anxiety.

Figure 01: Responses retrieved: Lecturers' perspective

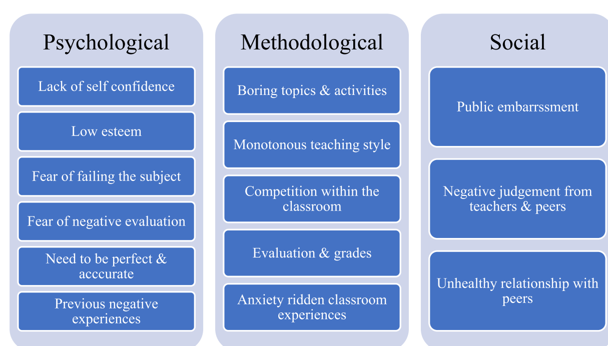


The responses revealed some compelling findings and 100% (n=40) of the total sample have pinpointed lack of confidence as one of the fundamental causes for speaking anxiety. All the participants (100%, n=40) have also presumed that some of the anxious students are hesitant to make errors because they are overly concerned with accuracy and consider speaking with an excellent accent as important. Poor pronunciation and improper use of grammar too were reported to have a remarkable share in the data analysis. It was also noteworthy that, 87% (n=34) of the total respondents have revealed that, having proper grammatical knowledge (82.5%, n=33) and poor pronunciation (70%,n=28) lead to anxiety provoking situations. Hence, the data presentation provides evidence that the low linguistic aptness creates a route to speaking anxiety. In consequence, 87.5% (n=35) of the total sample strongly insists the importance of an anxiety- free classroom which is not formal and restricted whereas (92.5%, n=37) have stated that previous negative experiences of the students will result in speaking anxiety. Out of the total respondents, 78% (n=31) were of the view that, lack of cohesiveness and cooperation among classmates have brought about the disadvantages to the teaching-learning process (57.5%, n=23). As a consequence, (70%,n=28) have strongly agreed with the fact that competition in the classroom will result in the students' reluctance to speak the second language. Interestingly, only a minority (30%, n=12) of the participants were of the view that, not having enough exposure to the second language will lead to anxiety. However, 70% (n=28) disagreed with this view. Moreover, the lecturers were of the perspective that evaluation and grades too have a significant effect on the speaking anxiety (90%, n=36). Moreover, 87.5% (n=35) admitted that the students feel ashamed if the teacher corrects the mistakes of the students on the spot in front of their peers in the classroom. In the same vein, majority of the participants declared that, the students did not like them to be deprecated by the lecturer. Thus, public embarrassment has been traced as another root cause for the second language speaking anxiety. Besides, a compelling finding was unveiled in the data analysis with regard to the role of teacher in the ESL classroom. Notably, 52.5% (n=21) have honestly claimed that, monotonous teaching style in a traditional classroom and boring topics & activities (62.5%, n=25) will cause anxiety. Hence, in the light of these findings, some of the potential causes underlying the students' hesitance and repression to speak the second language are brought forward as anxiety breeding situations.

In the wake of responses retrieved from the lecturers, three categories of possible sources for second language speaking anxiety were detected as psychological, methodological and social, which can be displayed within three categories as shown in the following diagram (Figure 02). According to the diagram, psychological causes of speaking fears may stem from the lack of self-confidence, low esteem, feeling of worry, fear of failing the subject, the fear of

negative evaluation, the need to be perfect & accurate and previous negative experiences. Besides, it also denotes that the instructional methods used in the classroom such as anxiety-ridden classrooms, monotonous teaching style, promoting competition within the classroom, boring topics and activities and evaluations and grades will result in language anxiety. Finally, it was also apparent that social causes such as public embarrassment, negative judgement from teachers and students, unhealthy relationship with peers and isolation will contribute to language anxiety to a greater extent.

Figure 02: Categories of possible sources of speaking anxiety



Discussion

Several factors can bring about second language speaking anxiety in the classroom. The impact of these factors will result in the reluctance of learners to speak the target language. Thus, the teachers are expected to help their students reduce such unfavorable feelings by identifying the root causes of speaking anxiety. The results of this study provided three categories of possible sources of second language speaking anxiety namely, Psychological, methodological and social. Among them, fear of negative evaluation was found to be the most significant one. A similar study was conducted by Oki and Ustaci (2013) which was focused on Turkish EFL learners. The findings of their study showed that the students preferred not to be corrected by their teachers when they made a mistake while speaking because they believed the corrections made by their teacher were a source of anxiety. This situation can be attributed to the Sri Lankan context as most of the students are highly distressed over the negative evaluations of the teacher as well as their peers. They are overly concerned with how they might be judged or perceived by others and they struggle to present a positive self- image to the others by withdrawing themselves from situations in which they might be evaluated. As a result, this leads to a heightened level of second language speaking anxiety. Krashen (1982) supports this view by claiming that language anxiety experienced by someone makes a direct impact on perceiving his/her image and that their anxiety level ultimately affects the learners' achievement.

In addition, it was apparent that the students' unwillingness to speak was not because they did not realize the value of learning English or laziness but because they believe that they are not good speakers of the second language. This can also be referred as sense of low esteem and the need to be perfect. In agreement with the findings from this study, a similar study was conducted by Liu (2006) in China, where the students' low level of language proficiency in terms of vocabulary, pronunciation and grammar caused them to have a high level of anxiety and low self confidence in their performance. So that the students were recommended to work hard both inside and outside the classroom in order to achieve their targets and to mitigate their anxiety in speaking. Therefore, in eliminating the sense of low esteem and lack of self-confidence, the teacher is expected to make students realize that the errors are a part of learning process and in order to learn the language, mistakes are unavoidable.

The study further denotes that the main sources of speaking anxiety are associated with certain teacher related factors and instructional practices such as boring topics and monotonous teaching style. That is, certain facets related to the teacher, heightened the inhibition of students to speak the target language. Indeed, effective teaching focuses more on the student during classroom activities. However, the reason for this may be

because in Sri Lanka, most of the teachers are used to typical methods of instruction such as chalk and board method and the reluctance and incapability of some teachers to integrate technology into teaching. Apart from that, Coa (2011) identifies certain interesting factors related to instructors with regard to speaking anxiety. He states that the unfriendly behaviour and unsympathetic treatment of teachers may cause the learners to be anxious. He further explains that the inappropriate style of teaching and an unhealthy classroom atmosphere will result in anxiety. Therefore, this study could shed light on the necessity of choosing appropriate instructional methods in minimizing the speaking anxiety of students. The students emphasized the necessity of using certain activities that will move them away from the monotonous teaching style and which will help them to cope up with their anxiety in speaking the target language. Thus, it was of paramount importance and the responsibility of the lecturer to design some interesting interactive speaking activities which will stimulate their interest in the subject and which will reduce their speaking anxiety in the classroom and to make teaching -learning enjoyable.

Interestingly, Young (1991) in his study explores about six possible sources of language anxiety stemming from three facets: the learner, the teacher and the pedagogical practices. That is, learner beliefs about how the language is learnt, teacher beliefs about how he/she teaches language, teacher-learner interactions, processes that are being followed in the class room and language evaluations are all possible causes of language anxiety. He further states that all these are correlated with one another. A similar view related to learner beliefs was expressed by Tanveer (2007). It was claimed that inner qualities of a particular learner can be resulted in anxious situations. Therefore, beliefs, opinions and weak language proficiency may lead to a higher degree of anxiety along with some other external factors such as social and cultural backgrounds
However, in scrutinizing the situation of the Sri Lankan context, learning a second language is considered as a challenge due to the influential role played by the mother tongue. Therefore, when learning a second language, the learner usually thinks about the target language in terms of the first language without realizing the fact that a language should be learnt in second language. Besides, speaking anxiety may prevent students from mastering the language. Hence igniting an enthusiasm to learn English should be prioritized within the ESL classroom. According to Alderman (2004), creating a learning community that provides the environment for "optimal motivation" can help reduce speaking anxiety. Hence, making fun of a wrong answer should not be encouraged and a norm of "mistake tolerance" should be ratified within the classroom. Moreover, students should be encouraged to ask for assistance without running the risk of embarrassment. On the part of teachers, as far as grouping practices were concerned, groups should be formed from mixed ability students where the students are given equally academically challenging tasks so that there is no differential treatment with respect to their language performance.

Conclusion

The research findings denoted that the main sources of speaking anxiety are associated with certain psychological, methodological and social facets. When observing the outcomes of the questionnaire and the semi-structured interview, it was apparent that all the participants involved in the study have stressed upon the inability of most of the students to express effectively in oral assignments and classroom presentations owing to the anxiety in speaking the target language. Furthermore, they have understood that the students' lack of ability and confidence to communicate in English have brought about disadvantages into the teaching-learning process. In the lecturers' perspective, anxiety in speaking English as a Second Language is a hindrance to obtain sufficient marks in the speaking assignments. For a lecture to be stimulating and attractive for both the lecturer and students,

there should be a good rapport maintained between them. Thus, all the lecturers insisted on the importance of participation of all students', asking for further clarification, seeking advice, stating difficulties. So as to enable them to strike up a conversation in the class confidently.

Due to the aforementioned facts brought forward, this study can be taken as a reference for the lecturers in identifying the possible sources of second language speaking anxiety and thereby to decide on the effective strategies that can be employed in order to alleviate the speaking anxiety of the students. Besides, the study unveils the fact that the delivery of the English language in the form of traditional classrooms is not always the best alternative, yet there are vital aspects to be concerned in minimizing their anxiety in speaking English and integrating them into an English speaking environment with a greater ease. The findings also pave the path for the lecturers to realize their own reactions that can possibly enhance or lessen the speaking anxiety of the students.

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Original Article

Sleep Quality and Sleep Disturbing Factors among Nurses in a Selected Hospital in Colombo, Sri Lanka

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Abstract

Sleep is a naturally recurring state of mind and body which is a vital human physiological process. The sleep quality of nurses has become a prominent social focus since they are engaging in work based on a shift schedule. The paucity of data available on sleep quality and associated factors in Sri Lanka led this study to be conducted among nurses at Apeksha Hospital, Sri Lanka. A descriptive cross-sectional study was conducted among 215 nurses at Apeksha Hospital, using a simple random - sampling method. A self-administered structured questionnaire was used as the data collection instrument and Pittsburgh Sleep Quality Index (PSQI) was used to measure the sleep quality among nurses. The majority (86.5%) were females. Of the participants 65.58% had deficient sleep (PSQI≥5) and 34.42% had healthy sleep (PSQI<5). The mean score of the sleep quality was 7.16±3.30. Sleep quality was significantly ($p<0.05$) associated with chronic symptoms ($p=0.003$), children status ($p=0.007$), night shift frequency per month ($p=0.029$), number of patients per night shift ($p=0.048$), number of working hours per week ($p=0.001$), sleep duration ($p=0.032$), sleep disturbances at night ($p=0.001$), sleep medication use ($p=0.020$), and daytime dysfunction ($p=0.001$). In conclusion, sleep quality was poor among nurses working at Apeksha Hospital, Sri Lanka. The characteristics of night shifts, such as number of shift duties, number of hours, and number of patients in the night shift, were associated with the sleep quality of nurses. Therefore, scheduling working hours and night shifts according to the `national and international guidelines are vital.

Keywords: Sleep quality, Pittsburgh sleep quality index, Nurses

Introduction

Sleep is a state of reduced consciousness and responsiveness from which an individual can be aroused by external stimulus (Zielinski et al., 2016). It is a biological necessity essential for life and optimal health. Average sleep duration in an adult is 7 to 8 hours (Adams et al., 2006). The quality of sleep is significant due to its close relation to the psychological and physical well-being of an individual (Galante et al., 2011). Sleep deficiency in the long-term may increase the risk of chronic illnesses such as obesity, diabetes, gastrointestinal disorders, hypertension, cardiovascular disease, Alzheimer's disease, and cancer (Kolo et al., 2017; Chernyshev et al., 2018). Deficient sleep is also associated with significantly increased risk of mortality (Chien et al., 2013), increased risk of coronary heart diseases (Chernyshev et al., 2018), impaired social relationships, drowsy driving, occupational accidents, and heightened risk of cardiovascular events (Lemma et al., 2012). The long-term sleep disorder leads to thought retardation, memory loss, slow response, irritability and even the increase in the possibility of depression and suicidal tendency (Mieda & Sakurai, 2013). According to economic estimates, sleep disorders are associated with large financial and non-financial costs. The greatest financial costs appear to be non-medical costs related to loss of productivity and accident risk (Hillman & Lack, 2013). Sleep problems can negatively affect the immune system and metabolism and can cause various health issues such as depression, hypertension, and coronary heart diseases (Fernandez et al., 2015). Occupational related sleep problems influence their sleep quality in daily life such as job satisfaction, effort-reward-imbalance, job insecurity and organizational injustice (Kim et al., 2017). There are many standard measures that are available to assess the sleep quality. The Pittsburgh Sleep Quality Index (PSQI) is one of the most widely used standardized questionnaire used to assess sleep quality and the factors that influence quality (Zitser et al., 2022).

Nurses have a higher rate of exposure to occupation related sleep problems. Sleep quality is one of the influential factors in nurses' performance. Sleep disorders of nurses could lead to mistakes in the treatment process and patients' care which might cause irreparable damages (Dagget et al., 2016). Hospitals are known to be both rewarding and stressful places to work. Nurses are the main workforce at hospitals, and work at a highly stressful and responsible environment (Dagget et al., 2016). Further, nurses must remain awake throughout the night while working the night shift (Costa et al., 2003). This makes their sleep time irregular (Costa et al., 2003). Shift work among health care professionals is associated with poor sleep quality and have shown to have deficient sleep when compared to non-shift work health professionals (Alshahrani et al., 2017). Therefore, nurses have a high rate of exposure to sleep related problems.

Age, gender, educational level and marital status were among the most common socio-demographic factors that has a relationship with sleep quality (Alshahrani et al., 2017). Moreover, the work-related variables such as level of experience, and shift work also had relationship with sleep quality (Alshahrani et al., 2017). Thus it is important to assess the nurses' sleep quality and the factors contributing to their sleep quality because it directly affects accuracy of nursing care worldwide.

Sri Lanka is one of the most stressful and busiest working countries for nurses (Warnakulasuriya et al., 2021). Many nurses have reported different sleep problems as well as lack of sleep leading to the poor performances in patient care in many hospitals in Sri Lanka (Samarasinghe et al., 2021). As a health care person, the nurse is responsible for providing a safe and good health care through the application of medical science knowledge, skill and expertise in meeting all people's health needs. Therefore, it is necessary to assess the sleep quality among 'nurses and its associated factors in Sri Lanka. Thus, assessment of nurses' sleep quality and its association with socio-demographic and work-related factors

may encourage the researchers to implement interventional studies. Such research will helps to improve nurses' sleep quality which is crucial for better work performance and increase the productivity of the hospital. Therefore, this study was conducted to determine sleep quality and factors associated with sleep disturbances among nurses in a selected Hospital in Colombo district, Sri Lanka.

Methodology

A descriptive cross-sectional study was conducted to determine the sleep quality and factors associated with sleep disturbances among nurses in a selected hospital in Colombo district Sri Lanka. Ethical approval (KIU/ERC/20/063) was obtained from the Ethics Review Committee of KIU prior to the data collection. Nurses were recruited using simple random sampling method till the sample size was reached. The sample size was calculated using Yamane formula (Yamane, 1967). A sample of 215 nurses who were willing to participate and who gave written informed consent were included in the study. Nurses who were not doing night shifts and taking long term medications were excluded from the study. Baseline and work-related data were obtained by a self-administered questionnaire which consisted of gender, age, BMI, educational level, monthly income, marital status, number of children, work history, type of employment, department, and working shift. Sleep quality was assessed using a validated Pittsburgh Sleep Quality Index (PSQI). It was a standard questionnaire with 9 items categorized in 7 dimensions of subjective sleep quality, sleep latency, habitual sleep efficiency, sleep duration, use of sleeping medication, sleep disturbances, and daytime dysfunction. The PSQI is a self-rated scale assessing sleep quality and sleep disturbances over 1 month interval. The global score rate from 0–21 while the global sleep quality score >5 indicates deficient sleep and <5 indicates healthy sleep. Collected data were entered into a database created using Microsoft excel 2019. After data cleaning, the excel database was exported into the IBM SPSS version 25. Data were analyzed using descriptive statistics. Categorical variables are expressed as frequencies and percentages. The Chi-square test was performed to assess the factors associated with sleep quality.

Results

In this study, total of 215 nurses completed the questionnaire. Majority of nurses were females (86.5%, n=186), aged between 25-30 years 51.2% (n=110). Most (95.3% n=205) of nurses reported that they had not engaged in leisure time exercises. Only 30.2% (n=65) had chronic symptoms (Table 1).

Table 1 Baseline characteristics of the study population

Baseline Characteristics	Frequency (n=215)	Percentage (%)
Gender		
Female	186	86.5
Male	29	13.5
Age (years)		
25-30	110	51.2
31-35	55	25.6
36-40	31	14.4
41-45	17	7.9
46-50	2	0.9
Marital status		
Unmarried	140	65.1
Married	75	34.9
Children status		
No	13	17.3
Yes	62	82.7
Number of Children		
0	13	17.3
1	37	49.3
2	22	29.3
3	3	4.0
Level of professional qualification		
Graduate	40	18.6
Diploma	175	81.4
Personal income per month		
<50000	5	2.3
51000-70000	164	76.3
71000-90000	35	16.3
>91000	11	5.1
BMI		
Underweight	12	5.6
Normal	150	69.8
Overweight	53	24.7
Exercise in leisure time		
Never/almost never	205	95.3
Sometimes	9	4.2
Often	1	0.5
Chronic symptoms		
No	150	69.8
Yes	65	30.2

According to the work-related characteristics of the nurses 77.7% (n=167) had <10 years of

professional experience. 85.1% (n=183) had >5 night shifts per month and 93.5% (n=201) had >40 working hours per week (Table 2).

Table 2 Distribution of occupational characteristics of Nurses

Characteristics	Frequency (n=215)	Percentage (%)
Professional experience (years)		
1-10	167	77.7
11-20	39	18.1
21-30	8	3.7
31-40	1	0.5
Night shift frequency per month		
>5	32	14.9
6-10	122	56.7
11-15	37	17.2
<15	24	11.2
Number of patients / night shift		
>20patient	87	40.5
21-40patient	76	35.3
41-60	42	19.5
>61	10	4.7
Number of patients/ day time		
>20patient	71	33.0
21-40patient	81	37.7
41-60	27	12.6
>61	36	16.7
Number of hours/weeks		
30-40	14	6.5
41-50	15	7.0
51-60	14	6.5
61-70	18	8.4
71-80	97	45.1
>81	57	26.5

PSQI scores range from 0 to 21 and a value >5 indicates deficient sleep and <5 indicates healthy sleep. Only 34.4% (n=74) had healthy sleep (Figure 1). The sleep quality score ranged as 0-16 and the mean score was 7.16± 3.30 (Figure 2).

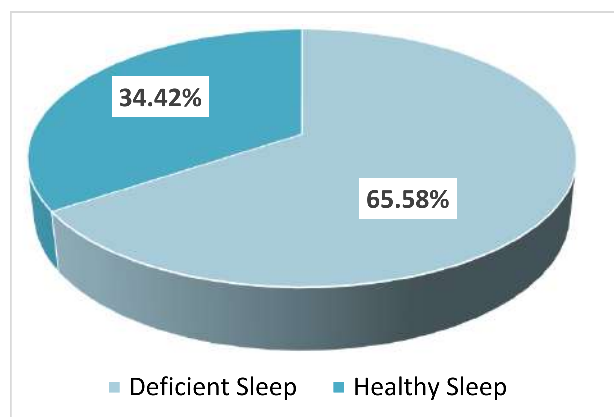

Figure 1: Sleep quality among nurses in Apeksha hospital in Colombo, Sri Lanka

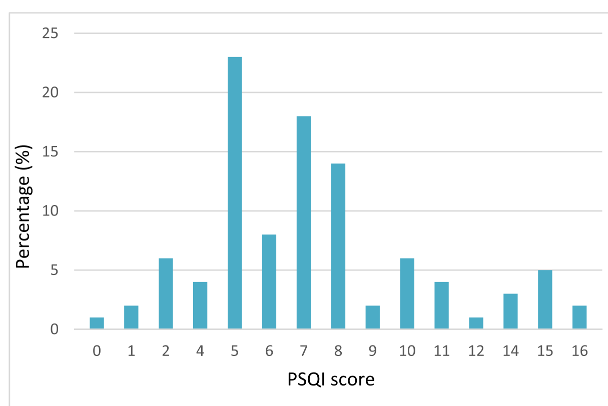

Figure 2: Sleep quality among nurses - Global Pittsburgh Sleep Quality Index Scores (0-16)

PSQI includes 7 dimensions of the sleep quality as subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, sleep medication use, daytime dysfunction. The severity level of each components showed that 82.3% (n=177) nurses had mild to severe dysfunction of their subjective sleep quality. While 76.7% (n=165) had >15 minutes sleep latency and only 23.7% (n=51) had >6 hours of sleep duration. Sleep efficiency participants was 62.3% (n=134). Majority (87.9%, n=189) of the participants had sleep disturbances during their sleep and 46.5% (n=100) had daytime dysfunction (Table 3).

Table 3: Severity of sleep quality components among Nurses

Factor	Normal Dysfunction	Mild Dysfunction	Moderate Dysfunction	Severe Dysfunction
Subjective Sleep	**Very Good**	**Fairly Good**	**Fairly Bad**	**Very Bad**
	38 (17.7 %)	139(64.7%)	31(14.4%)	7 (3.3%)
Sleep Latency	**≤15 minutes**	**16-30 minutes**	**31-60 minutes**	**>60 minutes**
	50(23.3 %)	65 (30.2%)	66(30.7%)	34(15.8%)
Sleep Duration	**>7 hours**	**6-7 hours**	**5-6 hours**	**<5 hours**
	38(17.7 %)	13(6%)	128(59.5%)	36(16.7%)
Sleep Efficiency*	**>85%**	**75-84%**	**65-74%**	**<65%**
	134(62. 3%)	35(16.3%)	36 (16.7%)	10(4.7%)
Sleep Disturbances	**Never**	**Once or twice a month**	**Once or twice a week**	**>times a week**
	26(12.1 %)	133(61.9%)	52 (24.9%)	4(1.9%)
Sleep Medication	**not during past month**	**less than once a week**	**once or twice a week**	**Three or more times a week**
	178(82. 8%)	4(1.9%)	27(12.6%)	6(2.8%)
Daytime Dysfunction	**0**	**1-2**	**3-4**	**5-6**
	115(53. 5%)	70(32.5%)	28 (13%)	2(0.9%°)

*Habitual sleep efficiency = (Number of hours slept/ Number of hours spent in bed) x 100

Sleep quality was significantly associated with chronic symptoms (p=0.003), children status (p=0.007), night shift frequency per month (p=0.029), number of patients per night shift (p=0.048), number of working hours per week (p=0.001), sleep duration (p=0.032), sleep disturbances at night (p=0.001), sleep medication use (p=0.020), daytime dysfunction (p=0.001). There was no statistically significant association between sleep quality and age, gender, body mass index (BMI), marital status, education level, exercise in leisure time, and the number of children in the house (p>0.05).

Table 4: Factors associated with sleep quality among Nurses

Characteristics	No. of good sleepers n(%)	No. of poor sleepers n(%)	p value
Gender			
Male	12(5%)	17(7.9%)	**0.396**
Female	62(28.8%)	124(57.7%)	
Age (years)			
25-30	39(18.1%)	71(33%)	
31 - 35	16(7.4%)	39(18.1%)	
36 - 40	11(51.1%)	20(9.3%)	**0.858**
41-45	7(3.3%)	10(4.7%)	
46-50	1(0.5%)	1(0.5%)	
Marital status			
Unmarried	53(24.7%)	87(40.5%)	**0.147**
Married	2(9.8%)	54(25.1%)	
Children status			
No	4(50.3%)	9 (12%)	**0.007***
Yes	17(22.7%)	45(60%)	
Level of professional qualification			
Graduate	11(5.1%)	29(13.5%)	**0.307**
Diploma	63(29.3%)	112(52.1%	
Personal income per month			
<50000	2(0.9%)	3(1.4%)	**0.690**
51000-70000	53(24.7%)	111(51.6%)	
71000-90000	14(6.5%)	21(9.8%)	
91000	5(2.3%)	6(2.8%)	
BMI			
Underweight	5(2.3%)	7(3.3%)	**0.816**
Normal	50(23.3%)	100(46.5%)	
Overweight	19(8.8%)	34(15.8%)	
Exercise in leisure time			
Never/almost never	70(32.6%)	135(62.8%)	**0.383**
Sometimes	3(1.7%)	6(2.8%0	
Often	1(0.5%)	0(0%)	
Chronic symptoms			
No	55(25.6%)	75(34.9%)	**0.003***
Yes	19(8.8%)	66(30.7)	
Professional experience (years)			
1-10	58(27%)	109(50.7%)	**0.537**
11-20	12(5.6%)	27(12.6%)	
21-30	3(1.4%)	5(2.3%)	
31-40	1(0.5%)	0(0%)	
Night shift frequency per month			
<5	7(3.3%)	25(11.6%)	**0.029***
6-10	37(17.2%)	85(39.5%)	
11-15	18(8.4%)	19(8.8%)	
>15	12(5.6%)	12(5.6%)	
Number of patients / night shift			
<20	36(16.7%)	51(23.7%)	**0.048***
21-40	127(12%)	49(22.8%)	
41-60	7(3.3%)	35(16.3%)	
>61	4(1.9%)	6(2.8%)	
Number of patients/day time			
<20	30(14%)	41(19.1%)	**0.225**
21-40	27(12.6%)	54(25.1%)	
41-60	9(4.2%)	18(8.4%)	
>61	8(3.7%)	28(13%)	
Number of hours/week			
30-40	2(0.9%)	12(5.6%)	**0.001***
41-50	7(3.3%)	8(3.7%)	
51-60	9(4.2%)	5(2.3%)	
61-70	4(1.9%)	14(6.5%)	
71-80	42(19.5%)	55(25.6%)	
>81	10(4.7%)	47(21.9%)	

**p < 0.05 indicates that the corresponding factor had significant influence on sleep quality.*

Table 5: Factors associated with Deficient sleep in PSQI

Components PSQI	Healthy %	Deficient %	p value
Subjective sleep quality	38(17.7%)	177(82.3%)	0.261
Sleep latency	50(23.3%)	165(76.7%)	0.320
Sleep duration	38(17.7%)	177(82.3%)	0.002*
Sleep efficiency	134(62.3%)	81(37.7%)	0.424
Sleep disturbance	26(12.1%)	189(87.9%)	0.001*
Use of sleep medications	178(82.8%)	37(17.2%)	0.032*
Daytime disfunction	115(53.5%)	100(46.5%)	0.021*

**p < 0.05 indicates that the corresponding factor had significant influence on sleep quality.*

Discussion

In this study, sleep quality was assessed among nurses working in a selected hospital in Colombo district, Sri Lanka. The data indicated that there was a high prevalence (65.58%) of deficient sleep quality among nurses in Apeksha hospital, Sri Lanka. Similarly, to this study some other studies globally reported a higher percentage of nurses with deficient sleep. Studies done in Nepal had 75% (Thapa et al., 2017) and 69% of deficient sleep among nurses respectively (Kaliyaperumal et al., 2017). The prevalence of nurses reported deficient sleep quality in a European study was 78% (McDowall et al., 2017). The sleep quality among nurses had nearly similar findings for most of the countries globally, despite its status as a developed or a developing country. In Sri Lanka nurses are the main workforce at hospitals and are working in a highly stressful and responsible environment (Warnakulasuriya et al., 2021). Further, there are limited number of staff working in most hospitals and thus leading to unpredictable workload (Warnakulasuriya et al., 2021). Therefore, the high number of deficient sleep quality reflected in the current study may be due to the limited staff, shift work patterns and unpredictable workload among nurses in Sri Lanka.

The result of the present study identified socio demographic factors such as age, gender, body mass index (BMI), marital status, education level and exercise in leisure time, were not significantly associated with deficient sleep

quality. These findings were similar with the study done by Akbari et al. (2016) which showed that gender and age were not associated with sleep quality among nurses. A study conducted by Salehi al el. (2010) also found that there was no association between marital status and sleep quality among nurses. A study done among Nurses in northeastern Ohio, USA found that there was no significant association between BMI and sleep quality among nurses (Huth et al., 2013). Interestingly in yet another study done by Mc Dowall among nurses reported that there was no statistically significant association found between poor sleep and exercise during leisure time (McDowall et al., 2017). Zhang et al. (2016) reported that there was no significant association found between personal income per month and education level with the sleep quality among nurses. These studies indicate that the findings are consistent with the present study. The findings of international studies and the Sri Lankan study highlights that sleep quality of nurses are not affected by the sociodemographic factors but rather it is work-related factors that can mostly affect the sleep quality of nurses.

The work-related factors such as number of night shifts, number of patients allocated in the night shift and long working hours in this population were significantly associated with deficient sleep quality. Sleep duration, sleep disturbances, daytime dysfunction and sleep medication also were associated with the sleep quality among nurses in this study. A study conducted in Turkey indicated that there was a relationship between sleep quality and work-related factors (Tarhan et al., 2017). In this study in Turkey, a high number of patients at night, night shift frequency per month and long work hours per week were associated with nurses' poor sleep. The number of patients in the charge at night and work hours per week could be taken as signs of workload, and further increased workload has been proved to be a hazard for fatigue or stress (Tarhan et al., 2017). Accordingly, those nurses with duty of several hours worked per week, nurses who worked >40 hours had lower sleep quality. In light of the current research findings, although few studies reported in literature the effect of hours worked per week on sleep quality, it can be said that nurses who work >40 hours a week are more fatigued physically and mentally and also the addition of the difficulties that come from working the night shift has a negative effect on their sleep quality. Further, as reported by Shao et al. nurses with increased night shift frequency had sleep problems more frequently (Shao et al., 2010). Moreover, the workload during a night shift is relatively heavy (Thapa et al., 2017). Night shift nurses often work independently with no group support. Therefore, nurses are likely to be more stressed during nightshifts than dayshifts resulting in altered biological rhythms, which directly cause poor sleep quality.

In the present study, association between health-related factors and sleep quality were discovered in addition to work-related factors. Chronic symptoms were significantly associated with poor sleep quality. These findings were consistent with the study by Chan et al., 2008 who showed that chronic symptoms such as gastrointestinal problems and joint, back or muscle pain were associated with insufficient sleep. Chien et al concluded that chronic symptoms have a large impact on peoples' life because it may result in pain and fatigue among them (Chien et al., 2013). Because of that those suffering from these symptoms often have sleep disturbances at night and end up with daytime sleep (Chien et al., 2013).

Conclusion and Recommendations

The present study concludes that the deficient sleep quality is a significant problem among nurses. Further that, this population night shift frequency per month, number of patients per night shift, number of working hours per week, sleep duration, sleep disturbances at night, sleep medication use, and daytime dysfunction paid a major role. These findings suggest that national guidelines should be developed to assess and enhance the sleep quality among nurses since it directly affects to quality of patient care. Furthermore, working hours of nursing staff

should be scheduled according to national and international guidelines. Health administrative and hospital authority should plan a periodic screening of sleep disorders among nurses to prevent complications of sleep problems. Policy makers should plan any alternative or adjustment method on current shift working practices. Allocating adequate staff members for the night shift, allowing the nurses to utilize the allotted rest hours properly, and allocating only the permitted number of night shifts for the nurses are crucial factors in maintaining adequate sleep quality. Advice should be included in both undergraduate programmes and continuing education to help nurses to recognize and improve their own sleep quality and life quality managers should create a supportive environment to encourage shift-working nurses to engage in healthy behaviours.

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Narrative review

Psychotherapies Used in the Treatment of Substance Use Disorder: A Narrative Review

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Abstract

Drug addiction is a serious social, economic, and health issue that persists worldwide. However, the efforts and certain measures taken to curb this problem seem to be counterproductive. The high addiction relapse rates and rising number of addiction cases show the requirement for proper treatment. In general, a variety of evidence-based treatment interventions for drug addiction are available. However, the gap between the availability of evidence-based therapies and their limited implementation in practice has yet to be bridged. As recommended by previous studies, psychotherapy ('Talk therapy'), pharmacotherapy (medication-assisted treatment), alone or in combination, can be used to treat drug addiction, with the capability of resolving the high relapse rate. This article provides an overview of the evidence for, and clinical application of, psychotherapeutic approaches used in the treatment of Substance Use Disorders (SUD). Given the scope of the literature, this review will focus on the psychotherapeutic approaches used in the treatment of illicit drug use disorders, including addictive pharmaceutics, while excluding legal drugs like alcohol and nicotine. Cognitive-Behavioural Therapy (CBT), Contingency Management interventions (CM), Community reinforcement approach, Motivational enhancement therapy, 12-step facilitation therapy, family therapy, and Multisystem Therapy (MST) are some of the most prevalent evidence-based psychotherapeutic approaches currently in practice. Evidence suggests that the combination of different psychotherapies with other treatment interventions is expected to improve treatment outcomes.

Keywords: drug addiction, addiction treatment, psychotherapies, prevention, and treatment

Introduction

Drug addiction is a serious social, economic, and health problem that persists worldwide. According to the world drug report by the United Nations Office of Drugs and Crime (UNODC), nearly 284 million individuals aged 15-64 used drugs globally in 2020, representing a 26% increase over the previous decade. Furthermore, the World Drug Report 2022 indicates that illegal drug markets can have local, community, or individual-level environmental impacts. (United Nations Office on Drugs and Crime, 2022). The high and rising drug addiction and relapse rates prevailing worldwide emphasise the necessity of proper treatment.

Addiction is the habit-forming psychological and physiological dependence on a substance or engagement in behaviour beyond voluntary control (Commonwealth of Australia | Department of Health and Aged Care, 2021). Drug addiction or substance use disorder (SUD), is a chronic disease characterized by compulsive or uncontrollable drug seeking and use, despite the harmful consequences (NIDA, 2018). It may also induce long-lasting changes in the brain (NIDA, 2020). It is a relapsing disorder, which has the potential to resume the habit, after a period of abstinence (NIDA, 2018).

A drug is any chemical that affects the body's function physiologically or psychologically (Commonwealth of Australia | Department of Health and Aged Care, 2021). Psychoactive substances affect the central nervous system and change how people perceive their behaviour (Sanli et al., 2015). Addictive drugs may be classified as legal or illegal. Legal drugs include alcohol, caffeine, and tobacco while; cannabis, ecstasy (3, 4-methylenedioxy-N-methamphetamine), cocaine, ice (methamphetamine), and heroin belong to the group of illegal drugs (Illicit substances). Similarly, addictive pharmaceutical drugs such as opium, and antidepressants are also legalized. However, being legalized does not imply that they are safer than illegal substances (UNODC, 2021). Addictive drugs can also be classified according to their mode of action, including stimulants, depressants, opioids, hallucinogens, and cannabinoids (Drug Classifications - Addiction Center, 2022). Stimulants are a type of drug that speeds up the transmission of messages between the brain and the body. Cocaine, caffeine, amphetamine, nicotine, betel nut, ice, and synthetic cathinone are examples of stimulants. However, over-stimulation can result in anxiety, panic, seizures, migraines, stomach cramps, hostility, and paranoia when taken in large dosages (Alchohol and Drug Foundation, 2021; Drug Classifications - Addiction Center, 2022). A depressant or central depressant is another type of drug that lowers neurotransmission levels by depressing or reducing arousal or stimulation in various areas of the brain. Benzodiazepines, barbiturates, kava, and gamma-hydroxybutyrate are examples of some depressants (Alchohol and Drug Foundation, 2021). Opioids are any natural or synthetic drugs originating from or linked to the Papaver somniferum. Opioids are medications that relieve pain other than those used to treat coughs or diarrhoea. Opioids attach to opioid receptors in the central nervous system and slow the transmission of information between the brain and the body. Overdosing with opioids can cause death and other complications. Commonly used opioids are heroin, methadone, naloxone, opium, fentanyl, and oxycodone (Alchohol and Drug Foundation, 2021; American Addiction Centers, 2022; Drug Classifications - Addiction Center, 2022). Hallucinogens are psychoactive agents that can cause hallucinations, perceptual anomalies, and other substantial subjective changes in thoughts, perception, emotion, and consciousness. Commonly used hallucinogens are Ayahuasca, N, N-Dimethyltryptamine (DMT), Psilocybin (magic mushrooms), Lysergic acid diethylamide (LSD), Half Moon, and Ketamine(American Addiction Centers, 2022; Drug Classifications - Addiction Center, 2022). Any chemical molecule that binds to the body's and brain's cannabinoid receptors and produces effects similar in nature to those of the Cannabis sativa plant is referred to as a "cannabinoid," regardless of structure or

origin (Alchohol and Drug Foundation, 2021). Commonly used cannabinoids are cannabis, medicinal cannabis, butane hash oil, synthetic cannabinoids, marijuana, weed, and hash. Both legal and illegal cannabinoids are commonly smoked, vaporized, or eaten (Alchohol and Drug Foundation, 2021).

Individuals who are addicted to these substances are often reluctant to acknowledge their dependence on the substance. Friends or family members are the first to notice the changes in their behaviour (Micheli et al., 2021). Some common signs and symptoms that can be used to identify a person suffering from drug addiction include; a change of friends (hanging out with friends who use drugs), becoming moody, negative, cranky, or worried all the time, asking to be left alone more often, having trouble concentrating, a lot of sleep, getting into fights, red or puffy eyes, lose or gains weight, coughing and having a runny nose most of the time (Micheli et al., 2021). The effects of drugs vary depending on the type of drug, the person using it, and their circumstances. (Commonwealth of Australia | Department of Health and Aged Care, 2021). Drugs have an impact on their mental health (U.S. Department of Health & Human Services, 2022), finances, relationships, and social lives, and may lead to an involvement with criminal activities (Commonwealth of Australia | Department of Health and Aged Care, 2021). Addicts will feel more awake, aware, and active after taking certain narcotics. Other drugs will make them feel calm and relaxed. Some can produce hallucinations and can change drug addicts' perceptions (Commonwealth of Australia | Department of Health and Aged Care, 2021). Other drugs might cause numbness (Commonwealth of Australia | Department of Health and Aged Care, 2021). Drug addiction usually leads to distress and discomfort in daily life activities. Long-term usage and higher doses have severe consequences that can affect the individual's health conditions, including, risks from sharing needles and lasting damage to important areas of the brain(NIDA, 2020) and organs, and could even lead to death (Commonwealth of Australia | Department of Health and Aged Care, 2021).

Since drug addiction is a chronic and complex disorder that affects multiple aspects of an individual's life, treatment is not simple, and a single one-time treatment is not possible. Typically, treatment of such a disorder incorporates many components directed to different aspects of the disorder and its consequences(NIDA, 2018). Successful treatment must not only stop the individual from consuming drugs but also, maintain a drug-free lifestyle while being productive as a family member, a colleague at work, or an individual in society (NIDA, 2018). There are several modalities of successful treatment for individuals with substance use disorder. The primary step however begins with detoxification (the process by which the body rids itself of a drug). Since detoxification involves severe medical consequences associated with drug withdrawal, this stage is often medically managed in a clinical setting (NIDA, 2018). Other treatment programs are provided thereafter to produce lasting recovery. As recommended by previous studies, psychotherapy, can be useful in increasing the effectivity of other drug addiction treatment measures when used collectively. (Jayamaha et al., 2021; National Institute of Mental Health, 2021).

Psychotherapy, is a treatment method which involves communication between an addict and a professional psychotherapist, and pharmacotherapy (medication-assisted treatment) alone or in combination, may be used to treat addiction disorders. (Jayamaha et al., 2021; National Institute of Mental Health, 2021) This sort of treatment or combination of treatments used will depend on the patient's specific needs and, in many cases, depends on the drugs they use (NIDA, 2018).

This review elaborates on the different psychotherapies used to treat individuals addicted to illicit drugs.

Psychotherapy, also known as "Talk therapy" and refers to a variety of treatment techniques that

aim to assist a person in identifying and changing troubling emotions, thoughts, and behaviours. Most of the psychotherapy is done one-on-one or in groups by a licensed, trained mental health professional (National Institute of Mental Health, 2021). Different psychotherapeutic approaches may be used to treat individuals suffering from drug addiction. A few of the most prevalent addiction therapies include Cognitive-Behavioural Therapy (CBT), contingency management interventions, community reinforcement approach plus vouchers, motivational enhancement therapy, 12-step facilitation therapy, Multisystem Therapy (MST), family therapy, and counselling interventions. A summary of these psychotherapies used in treating drug addiction is summarized in Table 1. Table 1 indicates psychotherapies used to treat drug addicts, practitioners involved in the treatment delivery, treatment method, research outcomes, and target addict population.

Cognitive Behavioural Therapy (CBT) is a type of psychotherapy that is effective in curing a wide range of mental health problems including anxiety, depression, and substance use disorder(American Psychological Association, 2017). It is an individualized therapy that may vary from individual to individual. CBT's primary goals include raising awareness of and correcting maladaptive behavioural patterns, increasing motivation for change, and developing healthy coping skills, which are useful in substance abuse treatment (McHugh et al., 2010b).
The efficacy of employing CBT for alcohol and drug users is supported by evidence from large-scale trials and reviews (Dutra et al., 2008; Magill & Ray, 2009; McHugh et al., 2010b). According to results obtained through a metanalytic review on the use of CBT for drug abuse treatment, cannabis treatment had the largest treatment effect sizes, followed by cocaine, and opioids, while polysubstance dependence treatment, had the smallest effect sizes (McHugh et al., 2010b). Comparable results were found in another meta-analytic review of CBT trials for alcohol and illicit drugs (Magill & Ray, 2009). CBT was seen as most effective in the treatment of marijuana users (Magill & Ray, 2009). In another study performed involving individuals with cocaine dependence, 60% had clean toxicology reports at 52-week follow-up (Rawson et al., 2006).

Contingency management is a behavioural intervention whereby positive, quantifiable behaviours are rewarded with meaningful reinforcement (Byrne & Petry, 2013). Reinforcements may include vouchers that can be worth goods or any service or draws for winning prizes (Byrne & Petry, 2013). It helps substance abusers get into treatment, stay in treatment for longer (enhanced retention in treatment) (Byrne & Petry, 2013, Petry et al., 2005), and achieve long-term abstinence from substances (Petry et al., 2005; Rawson et al., 2006). The contingency management (CM) approach has been successful in treating individuals addicted to alcohol (NIDA, 2018; Petry et al., 2000), nicotine (Hunt et al., 2010; NIDA, 2018; Roll et al., 1996, 2000; Stitzer et al., 1986), stimulants (NIDA, 2018), opioids and opiates, (Higgins et al., 1986; Preston et al., 1999; Robles et al., 2002), marijuana (Budney et al., 2000; Kadden et al., 2007; NIDA, 2018; Sigmon et al., 2000)6, Benzodiazepines (Maciej Serda et al., 1979), Cocaine (Higgins S. T. et al., 1994), and Methamphetamine (Roll et al., 2006). CM procedures are ideal to be implemented in community-based settings (Petry et al., 2004).

Community reinforcement approach or CRA is defined as "a broad-spectrum behavioral treatment approach for substance abuse problems that utilizes social, recreational, familial, and vocational reinforcers to aid clients in the recovery process" (Roozen et al., 2013) This 24-week CRA treatment has been applied to treat substance use disorders resulting from the use of alcohol, cocaine (Abbott, 2009; Garcia-Rodriguez et al., 2009; Secades-Villa et al., 2008), heroin and opioids (Roozen et al., 2004), in outpatient settings. The use of CRA treatment for cocaine addicts has shown better treatment retention (Higgins et al., 2003), and continued abstinence (Secades-Villa et al., 2008). Combining the usual CRA with vouchers has shown to be more effective than the usual

CRA treatment alone (Garcia-Rodriguez et al., 2009). The currently practiced CRA treatment has two variants. One approach targets' adolescents addicted to substance use along with their caregivers; (Adolescent Community Reinforcement Approach - ACRA), while other works through family members to engage individuals who refuse treatment (Community Reinforcement and Family Training - CRAFT) (Roozen et al., 2013).

Motivational Enhancement Therapy (MET) was originally created as an adaptation of Motivational interviewing (MI) principles and behavioural planning to promote alcohol abstinence ("Project MATCH: Rationale and Methods for a Multisite Clinical Trial Matching Patients to Alcoholism Treatment," 1993) , but have also been used to treat other drug addicts of marijuana and cocaine (Rajita Sinha et al., 2003; Rohsenow et al., 2004). Evidence suggests that MET treatment together with other forms of psychological treatment approaches like CM, and vouchers could improve treatment retention and completion (Rajita Sinha et al., 2003) and that it is ideal for individuals showing low initial motivation for treatment (Rohsenow et al., 2004). MET is applied to understand the rationale for and against change, as well as to build motivation for taking steps in the positive direction. It is helpful to both adolescents and adults, develops a perspective about one's behaviour, and emphasizes personal strengths, empathy, and autonomy (Lenz et al., 2016).

The 12-step facilitation therapy used to treat drug addiction offers structure and support for people in all stages of addiction recovery. They are commonly offered at treatment facilities alongside counselling and other drug treatments. This treatment is used to treat some behavioural addictions and some drug addictions like cocaine and opioid (12-Step Facilitation Therapies for Substance Abuse - Addiction Resource, n.d.). Since the 12-step approach is not a medical or comprehensive treatment followed by several self-help groups (e.g., Alcoholics Anonymous, Narcotics Anonymous, Cocaine Anonymous) or drug-specific (e.g., Crystal Meth Anonymous), they need to be implemented alongside professional drug treatment ventures. It can complement and extend the effects of professional treatment (NIDA, 2018).

Multisystemic therapy (MST) is a home-based treatment supported by evidence, that was initially designed for youth with serious anti-social behaviour who are at significant risk of out-of-home placement and their families and has since been adapted to address other difficult clinical problems faced by youth and their families including drug addiction (Sheidow & Henggeler, 2008; Henggeler & Schaeffer, 2016) Extensive research-based evidence shows the effectiveness of MST as a treatment for youth who abuse violent substances (Randall & Cunningham, 2003).

Despite the success of the treatment strategies elaborated previously, there is much work to be done to improve the rate of treatment response. Several novel approaches are being studied to enhance behavioral treatments for treating drug addiction. The use of computer-assisted delivery of treatment is one such approach (McHugh et al., 2010a).

Furthermore, some psychotherapies have not yet been researched and have not received much attention from researchers. Eye Movement Desensitization and Reprocessing (EMDR) and Seeking Safety are two such approaches that are less frequently used (Leah Miller, 2022). EMDR aids individuals in recovering from traumatic events. Seeking Safety is a therapy that emphasizes values to combat the loss of ideals experienced in trauma and drug abuse (Leah Miller, 2022). However, other reports show that EMDR was officially endorsed by the American Psychological Association, and Seeking Safety & Other Trauma-Focused Therapies are developed under a grant from the National Institute on Drug Abuse (NIDA). Further research on the above interventions will facilitate successful incorporation into addiction treatment.

According to the American Addiction Centre the report by Miller (2022) stated that, in addition to the most standard psychotherapy treatments mentioned in Table 1, there are other types of novel therapies that can be used to support drug addiction recovery (Miller, 2022). These other types of holistic and alternative therapies can aid in the promotion of recovery through stress management and general well-being, even though they do function as adequate replacements for substance use treatment programs themselves (Leah Miller, 2022). Medication, yoga, massage, and equine & animal-assisted therapy are the most upcoming useful complementary alternative therapies (Leah Miller, 2022).

According to research findings, mindfulness meditation is one of the easy alternative therapy techniques that may be practiced after treatment is fully completed. The above technique can help individuals to benefit more from their psychotherapy treatments. Meditation is yet another method that can be used in addiction treatment owing to its positive impact on depression, anxiety, and overall well-being (NIDA, 2020). Yoga is a gentle alternative therapy practice that emphasizes relaxation and deep breathing in addition to other more strenuous methods (NIDA, 2020). In addition, yoga provides numerous advantages for drug addicts including a decrease in stress or physical tension as well as a sense of increased strength or physical fitness, serenity, and self-aware (NIDA, 2020). The massage technique is another alternative therapy that can help people to relax without the use of drugs and to feel less physically tense. An individual's self-care routine can include massage, and they may even utilize as a kind of self-rewarding for tiny victories along the way to recovery (NIDA, 2020).

Some early research suggests that massage therapy may be useful in treating a range of withdrawal substances and various symptoms that can occur during withdrawal (NIDA, 2020). Equine & animal-assisted therapy is another important therapy technique. Horse-assisted therapy has shown promising results in treating drug addiction according to some studies (Burzinski & Zgierska, 2016). Integration of different animals assisted therapies into substance abuse treatment is gaining popularity at present (Burzinski C. A. & Zgierska A., 2016). These programs encourage extended treatment stays and increase the likelihood that patients will complete their care (Burzinski C.A. & Zgierska A., 2016). Substance abusers experience acceptance, worthiness, competence, and emotional support because of these animal-assisted therapies(Burzinski C.A. & Zgierska A., 2016). There are programs that offer pet-friendly rehab services(Burzinski C.A. & Zgierska A., 2016). Even though psychotherapies may have some disadvantages which include longer time periods to reach treatment benefits and not being able to address actual crisis situations promptly, the benefits of psychotherapies when used in combination with other treatment measures outweigh the disadvantages. (APSense Ltd, 2021)

Conclusion

Psychotherapies, especially when combined with pharmacotherapy, are an important and effective component of substance abuse treatment. In the treatment of illicit drug addiction, behavioral and cognitive therapy have been found to be effective psychotherapeutics. According to the evidence presented in this review, psychological approaches could be used effectively to treat illicit drug addiction, but measures such as community reinforcement and contingency management are rarely used. When combined with pharmacological treatments, the above approaches provide better treatment outcomes than either form of treatment alone.

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Table 1- Psychotherapies used in drug addiction

Psychotherapy	Practitioner involved	Treatment method	Research outcomes	Target addict population	References
Cognitive-Behavioural Therapy (CBT)	Psychotherapist Clinical psychologist	- CBT is to improve patient self-control by anticipating potential problems and helping to develop effective coping strategies. - CBT Specialized treatment techniques include, exploring the positive and negative consequences of continued drug use, early detection of cravings, and identifying potential risk factors for one's use and successfully coping with cravings and developing strategies to avoid those high-risk situations.	- Change substance usage habits. - Helping people learn how to identify and challenge the negative, irrational thought patterns that lead to substance use. - Teaches new coping skills to help people deal with stress, cravings, and relapses.	Alcohol Marijuana Cocaine Methamphetamine Nicotine	6,9
Contingency Management Interventions	Psychotherapist Counsellor	- Giving patients direct rewards to strengthen positive behaviours such as avoidance. - At Voucher-Based Strengthening (VBR), the patient receives a voucher for each drug-free urine sample provided. (The voucher has a cash value that can be exchanged for food items, movie passes or other goods or services that conform to a drug-free lifestyle.)	- Highly effective in increasing treatment retention and promoting drug avoidance and supportive for healthy drug-free life. - Voucher-Based Strengthening (VBR) Enhances Other Community Based Therapies for Adults Who uses opioids (especially heroin) or stimulants (especially cocaine) or both casually.	Alcohol Stimulants Opioids Marijuana Nicotine	6,9,10
Community Reinforcement Approach Plus Vouchers	Psychotherapist Counsellor	- Intensive 24-week outpatient therapy. - Patients attend one or two individual counselling sessions every week. - The focus is on improving family functioning, learning a variety of skills to minimize drug use, receiving vocational counselling, and developing new recreational activities and social networks. - Patients provide urine samples two or three times each week and receive vouchers when they test negative for cocaine. - The value of the vouchers increases with consecutive clean samples. Patients may exchange vouchers for retail goods that are consistent with a cocaine-free lifestyle.	- Reduce alcohol consumption for patients whose drinking is associated with cocaine use. - Therapy helps patients engage in treatment, learn new life skills and assists them in going long periods of time without cocaine use.	Alcohol Cocaine	6,11

Psychotherapy	Practitioner involved	Treatment method	Research outcomes	Target addict population	References
Motivational Enhancement Therapy (MET)	Psychotherapist Substance abuse counsellor	- MET is a patient centred counselling approach for initiating behaviour change by helping individuals resolve ambivalence about engaging in treatment and stopping drug use. - Increase internal motivation to change in a short amount of time. - MET includes an initial assessment battery session, followed by 2-4 individual treatment sessions with a therapist.	- Used successfully with alcoholics to improve both treatment engagement and treatment outcomes (e.g., reductions in problem drinking). - Used successfully with adult marijuana-dependent individuals in combination with cognitive-behavioural therapy, comprising a more comprehensive treatment approach. - More effective for engaging patients in therapy than for changing actual drug use.	Alcohol Marijuana Nicotine	[6,12,13]
12-Step Facilitation Therapy	Psychotherapist Substance abuse counsellor	- This is an active engagement method that aims to increase the possibility of a substance abuser joining and actively participating in 12-step self-help groups, hence promoting abstinence.	- The efficacy of 12-step programs has only been demonstrated for alcohol dependence. Currently, research on other drugs is being conducted. - But this treatment seems to promise to help drug users recover	Alcohol Stimulants Opioids	[6,14]
Multisystemic therapy (MST)	Clinical psychologist Psychotherapist MST counsellor	- Focuses on changing the thinking and behaviour of adolescents and their parents by using cognitive-behavioural and social development strategies. It focuses on family strengths. - Focused on building adolescent peer skills, acquiring academic and professional skills. - Not focus on blaming the family or labelling parents. But here the key to long-term success is empowering caregivers.	- Avoiding high abandonment rates and promoting responsible behaviour, reducing irresponsible actions by family members, addressing what is currently happening in adolescence, and focusing on prompt action on specific issues. - Significantly reduces adolescent drug use during treatment and for at least six months. - Reduces the number of incarcerations and the placement of minors outside the home.	Children and adolescents who abuse alcohol and other drugs	[6,15]

Psychotherapy	Practitioner involved	Treatment method	Research outcomes	Target addict population	References
Family therapy	Psychotherapist Family counsellor	- Treatment includes individual and family sessions held in a clinic, in the home, or with family members at the family court, school, or other community locations. - During individual sessions, the focus is on decision making, negotiation, and problem-solving skills. Sessions with family members focus on parenting styles, using their influence productively and in a developmentally appropriate manner.	- Effective to overcome family conflicts and maladaptive transgenerational tendencies. - Especially beneficial for families that are dealing with the effects of substance abuse.	Alcohol Other drugs	[6,16]
Counselling Interventions	Psychotherapist Counsellor	- Counselling is a non-directive, humanistic, client-centred approach to an individual's difficulties. - Problem-solving, Goal setting, Relapse prevention and management, Harm Reduction, Brief intervention, Relaxation strategies, Grounding, Mindfulness, Challenging unhelpful thinking, Anger management, Assertiveness training.	Supportive-expressive strategies make it easier for clients to talk about their own experiences, while expressive techniques aid in the identification and resolution of personal relationship issues.	Alcohol Other drugs	[6,17,18]

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Original Article

An analytical insight into the structure of the Brechtian theatre based on the plays 'Mother Courage and Her Children' and 'The Caucasian Chalk Circle'

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Abstract

Bertolt Brecht developed the form of the 'epic theatre' which can be defined as the foundation of the logical diversion of the direction of the conventional theatre. Brecht through this route of the epic theatre utilizes the theatre as a social and innovative logical instrument with the motive of initiating a social change which will have an impact on the existing social texture and the mentality of the social beings. The research focuses on analyzing how Brecht pursued a rationalistic route deviating from the core of the conventional theatrical structure, in instituting the form of the 'epic theatre' which can be defined as the foundation of the logical diversion of the direction of the conventional theatre. The foremost Brechtian plays, 'Mother Courage and Her Children and 'The Caucasian Chalk Circle' were analyzed to examine to which extent Brecht portrays the inner conflicts which social beings undergo in identifying their survival in relation to the discipline of emotion and reason. The data collecting procedure was conducted by utilizing secondary data collection methods. Accordingly, content analysis (conceptual analysis, relational analysis), discourse analysis and structural analysis were used in collecting and analyzing the relevant data. The study focused on analyzing the two plays Mother Courage and Her Children and 'The Caucasian Chalk Circle' based on the Marxist ideological perspectives. The plays, 'Mother Courage and Her Children, and 'The Caucasian Chalk Circle, induce the spectator to contemplate and reflect on the Brechtian thematic perspectives such as 'Victimization of the human being through the insatiable desire for material comfort, human incapability to confront the social evils, the dichotomy between emotion and reason etc. Thus, approaching the irrational social symptoms from a communist political point of view, Brecht within his plays portrays the inner conflicts which social beings undergo in identifying their survival in relation to the discipline of emotion and reason. 'Grusha' in 'The Caucasian Chalk Circle and 'Kattrin' in 'Mother Courage and Her Children' pursue the route of the universal principle of humanity which functions as the instinctive element in contrast to the rationally moulded sphere of reason. Brecht can be identified as a rebel whose intention is to move the social structure towards a new sphere in persuading the people to perceive through the obscured social veil. Along with the ideologies such as Marxism and the influence of the political theatre of Erwin Piscator, Brecht made an effort to transform the theatre into a source of social revival, thought inspiration and a foundation for social discourse.

Keywords: *Brechtian plays, epic theatre, social reality, rationality, revolutionary approach*

Introduction

Drama, which delves into the core of the social complex, approaches the hidden as well as common human realities, diagnoses the traumatic social mechanisms and perceives the existing elements of the natural world through a universal reality. Further it echoes the muted voices of the fragile human bodies and creates a space to expose and reveal the repressed human desires, instincts and expectations as a multifaceted social mirror with diverse reflections. Evolving through varied social dimensions and portraying the contemporary milieus, the structure of the theatre and its objectives experienced several transformations in relation to the influence of other social diversities. In examining the different theatrical forms which emerged along with the ideological movements such as romanticism, realism, naturalism, Marxism etc: it can be identified that the social consciousness of the individuals becomes thoroughly stimulated with a view to a socio-political change within the social whole.

The theatrical structure that fashions itself based on Romanticism creates a theatre of illusion where the irrational myths, supernatural forces, emotive elements and individual heroism evolve an idealized and abstract world with which the spectator is induced to identify himself. Within the realistic theatrical form, the existing social realities, conflicts, symptoms, individual naturality and common existential phenomena are portrayed in structuring a real-life sphere on the stage. In sharp contrast to these forms of theatre, 'the epic theatre (Brechtian theatre)' constructs its theatrical setting based on the rational, non-emotive, intellectual and unpretentious elements with the intention of guiding the spectators to enlighten themselves and achieve self-realization pertaining to the social aspects which are dramatized within the theatre, maintaining a mental gap, a distance between the theatrical performances and their own 'selves'. Deviating from the core of the conventional theatrical structure, Brecht pursues a rationalistic route in instituting the form of the 'epic theatre' which can be defined as the foundation of the logical diversion of the direction of the conventional theatre. Consequently, the settings, techniques and particular principles of epic theatre determine its distinctive form which concentrates on educating, enlightening and instructing the spectator rather than providing mere amusement and emotional inspiration. Evading the audience from attaching and identifying themselves with the dramatic characters in an emotional affinity, the Brechtian theatre induces them to critically examine, rationally realize and reason about the play, its thematic aspects and the social elements maintaining a certain distance as a detached observer. Brecht utilizes this dramatic technique which is introduced to encourage the spectator and the dramatic performances to represent and exist within two disparate spheres which are unrelated both in time and space. Along with the theatrical principles of epic theatre, the dramatist becomes capable of addressing and implying the theme, and the subject of his play without restricting and compressing the dramatic elements to an illusory or a realistic setting. That employs certain devices in making the spectator conscious of the fact that he is not watching a real-world phenomenon, but a theatrical performance. While the conventional theatrical techniques portray characters with indefinable human nature which can only be manipulated by nature, fate or invisible mystified force, the characters of Brechtian theatre are created as the components of the social complex, whose existence is changed and controlled by the individual as well as social mechanisms.

Methodology

The data collecting procedure was conducted utilizing secondary data collection methods. Accordingly, content analysis (conceptual analysis, relational analysis), discourse analysis and structural analysis were used in collecting and analyzing the relevant data. The study focused on analyzing the two plays 'Mother

Courage and Her Children and 'The Caucasian Chalk Circle' based on the Marxist ideological perspectives.

Through content analysis, the content of the referred texts was thoroughly analyzed in relation to the basic themes that are elucidated within the study. Thus, the relevant texts were examined based on the portrayal of the individual characters, their behavioural and thinking pattern, pertinent concepts, themes, ideologies, theories and criticisms. Accordingly utilizing the main two types of content analysis; conceptual analysis and relational analysis, the fundamental concepts, their relationship and the meanings they imply, their relation to the thematic perspectives of the study and the rational assumptions they evolve, were identified and analyzed based on the key elements of the study.

Consequently, discourse analysis was employed in critically analyzing the selected texts concentrating on the dialogues within the text, most essentially, the conversational pattern and the manner in which certain words were used. Through this analytical method, the individual, psychological, social and cultural characteristics, the communal beliefs, and the interactive and conflicting relationships were cautiously examined analyzing the conversations in the text in relation to the situation, the manner through which the interaction occurs and the outer socio-cultural forces which influence the situation and the communication.

Pursuing the means of structural analysis the relevant texts were studied scrutinizing the characters, the active details (motifs, symbols), themes, and the perspectives that were developed and connoted by the author through the portrayal of characters, setting and language.

Results

Brecht through the route of the epic theatre utilizes the theatre as a social and innovative logical instrument with the motive of initiating a social change which will have an impact on the existing social texture and the mentality of the social beings. Thus, Brecht can be identified as a rebel whose intention is to move the social structure towards a new sphere in persuading the people to perceive through the obscured social veil. Along with the ideologies such as Marxism and the influence of the political theatre of Erwin Piscator, Brecht made an effort to transform the theatre into a source of social revival, thought inspiration and a foundation for social discourse.

In eliminating the defects of the conventional theatre from the epic theatre, Brecht assigns particular significance to each dramatic element and makes their individual involvement within the play highly influential. Hence, music and stage settings are not utilized as the elements which emphasize the emotional and appealing scenes but interrupt the continuation of the play by making the audience rationally aware of the incidents, motives, actions and settings. That encourages them to judge, evaluate and criticize the performance with an unprejudiced view. Within the Brechtian theatre, the actor and the character exist within separated realities. The Brechtian actor maintains his independence in controlling his emotions, changing his actions and revealing his comments on the character based on a rational interpretation. In observing the social or human subjects within epic theatre through a critical and demonstrative approach, Martin Esslin exemplifies that process as 'the study of human nature is thus replaced by human relations' (Esslin, 1959). Consequently, through the theoretical aspect of 'Gestus[1]' of epic theatre, Brecht focuses on expressing the social behaviour and attitudinal changes of the human being in affiliating with the social other and thus the social or the outer life of the characters is given a thorough emphasis.

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1 Gestus is an acting technique developed by the German theatre practitioner Bertolt Brecht. It carries the sense of a combination of physical gestures and "gist" or attitude. It is a means by which "an attitude or single aspect of an attitude" is revealed, insofar as it is "expressible in words or actions."

The plays, 'Mother Courage and Her Children and 'The Caucasian Chalk Circle' are two of the foremost Brechtian plays that induce the spectator to contemplate and reflect on the Brechtian thematic perspectives such as 'Victimization of the human being through the insatiable desire for material comfort, human incapability to confront with the social evils, the dichotomy between emotion and reason etc. Thus, approaching the irrational social symptoms through a communist political point of view, Brecht within his plays portrays the inner conflicts that social beings undergo in identifying their survival in relation to the discipline of emotion and reason. Oscillating between these two spheres, Brechtian thematic expressions fashion a dramatic realm through which the spectator is induced to rationally think, argue, interpret and build a socio-political discourse. The emotive appearance which overwhelms the social and judicial boundaries evolves a virtuous reality though it does not exist within the structure of rationality. 'Grusha' in 'The Caucasian Chalk Circle and 'Kattrin' in 'Mother Courage and Her Children' pursue the route of the universal principle of humanity which functions as the instinctive element in contrast to the rationally moulded sphere of reason. Their intuitive emotional values subdue the rational self-motives in identifying themselves with the universal 'Mother figure'. Yet, viewing through the Marxist ideological perspectives, Brecht endeavours to elevate the concept of rational self-control and the non-emotive realization within the texture of self-consciousness in initiating the fact that the submission of one's self to the inner emotive stimulations compel them to succumb to the self-annihilation. With the intention of establishing a revolutionary transformation, the Brechtian theatrical structure perceives 'Violence' as an instrument which is both rational and irrational and in another sense both moral and immoral, which emerges through the inner struggle between the self-emotional impulses and the rational self-motives of the principle of reason. According to the Brechtian view, violence has the tendency to oscillate between the boundaries of morality and immorality in manipulating the prevailing social order and the human condition to encounter a transformation towards perfection or obliteration. In further analysing this approach, it can be stated that what Brecht values is not the violence which evolves the total negative destruction, but the violence which annihilates the other detrimental violence. The theatrical structure that the Brechtian concept forms, portrays the social complex as a sphere where God's omnipresent existence is absent and nullified. Consequently, the Brechtian theatre which opens a rationalistic third eye in piercing through the illusory social veil and perceiving an objective impartial reality appears to be an innovative analytical tool which delves deep into the social sphere and brings out that hidden reality through a new critical dimension.

Discussion

Brecht despite the fact that his experiences and observations are related to the western societal sphere examines and absorbs the eastern literature and disciplines of art, with the main focus on traditional and historical narratives and folklore. The Brechtian plays, 'The Caucasian Chalk Circle and 'Mother Courage and Her Children', develop an intimate relationship and familiarity with the Sri Lankan literary as well as social context approaching Sri Lankan theatre through their Sinhala translations by Henry Jayasena. The play 'The Caucasian Chalk Circle' which is extracted and adapted from Chinese folklore, not only represents the Chinese historical setting but addresses the human condition and the intricate mechanism through which social order operates, based on a universal thematic expression. The folklore which is adapted within the play 'the Caucasian Chalk Circle' reflects the similarities to the 'Ummagga Jathakaya' in Sri Lankan literature and to the parable of King Solomon in the text Bible conveying the fact that owing to the universal applicability of the play, it becomes capable of gaining access to the inner perceptions, social concepts and existing realities of the oriental and western contexts. Consequently, within the Sri Lankan drama sphere where the traditional dramatic features involved the religious, as well as

cultural mythologies in portraying the historical narratives, the influence of the Brechtian theatrical concepts, generates a new episode within which the Sinhalese social reality is assigned a rational reality. The dramatist Henry Jayasena by acquainting the Sri Lankan theatrical structure with the Brechtian theatre allows the spectator to move away from the traditionally prescribed dimension of perceiving the dramatic elements, plot and themes which are portrayed within the dramatized environment. Still clinging to the historical substance of the dramatic plot, the traditional Sri Lankan dramatist is confined to a certain frame thus rendering him incapable of attributing a sense and rational appearance to the historical meaning and narrative significance of the dramatic elements. The translated version of the play 'The Caucasian Chalk Circle' along with the dramatic elements such as the narrator, songs and masks which have a familiarity to the Sri Lankan traditional theatre creates a vital impact focusing on designing and assigning a value and meaning to the old historical significance of the plot of the drama. Within this new approach of the drama to the contemporary social order and the human condition, the spectator is able to perceive the rationality, socio-political implication and critical evaluations of the plot evading the narrowed vision which is enforced by the traditional theatrical structure. Thus, the perspectives on capitalism, social divisions, the deformed agency of war, penury, social issues and the social position of the feminine figure induce the Sri Lankan spectator to expose his mental aptitude in interpreting those concepts and the realities portrayed by them with a critical and logical view.

Bertolt Brecht in the process of eliminating the defects and certain constraints of the conventional theatrical frame, critically exemplifies how those negative aspects compel the spectators to become transfixed and emotionally attached to the dramatic performances restricting them from perceiving and rationalizing beyond the theatrical appearances. Thus, within the dramatic space of irrational and emotional reality, the audience absorbs the dramatized coloured reality that the actors and other dramatic elements portray, without approaching it through a logical dimension and a detached observation. With that, theatre is interpreted to be just a channel of entertainment through which the mental relaxation and the momentary escape of the spectator into the dramatized reality will be enhanced enabling him to identify himself with the heroic idealized figure, being oblivious to his own true self. Thus, Brecht views the illusory affinity of the audience with the dramatic characters as,

"How long are our souls going to have to leave our 'gross' bodies under cover of darkness to penetrate into those dream figures up there on the rostrum, in order to share their transports that would otherwise be denied to us?" (Brecht, 1959,)

Bertolt Brecht by bringing a new theatrical dimension through which the whole social structure is critically and judiciously examined and evaluated, pioneered in establishing a rational change within the existing order of the theatre. In an intimate ideological combination with Marxism and socio-psychological concepts, Brechtian theatre exposes the spectator's views into a theatrical mirror within which the thematic perspectives, social elements and human condition are reflected facilitating the audience to become unprejudiced independent critics. In analysing the ideological concepts and the theatrical mechanisms which Brecht adopts in establishing his 'epic theatre, it can be stated that his principle of detaching the audience from emotionally identifying themselves with the characters on the stage cannot be identified as applicable to every character and situation. In elaborating that criticism further, it can be stated that the characters like 'Grusha' in the play 'The Caucasian Chalk Circle and 'Kattrin' in 'Mother Courage and Her Children', whose emotional sensitivity overflowed the boundaries of social demarcations exposing their humane expression towards the social other cannot be judged based on a rationalistic dimension resisting the emotional identification. The connotation of the moral sense which is implied through those

characters can be interpreted by the spectator viewing it through the dimension of emotion. Thus, in that sense, it can be questioned whether it will be possible for the spectator to identify the portrayal of the universal 'Mother figure' based on rationalistic reasoning repudiating its emotional significance.

Conclusion

Consequently, pursuing the ideological perspectives of Marxism, Brecht through his rational theatrical structure, elaborately fashions the deformed position of the human within the capitalist social order inducing the people to enlighten themselves about their restricted life sphere. Within this innovative process of creating a novel and drastic change, though Brecht endeavours to divert the direction in which the contemporary social order functions, he becomes incapable of bringing forward a concrete convincing step to be taken in implementing this expectantly predicted change. As Martin Esslin elucidates in his text 'Brecht, a choice of evils (1959), 'Change the world': it needs to be changed!' is an exhortation that runs through Brecht's plays like a refrain. But he never succeeded in convincingly demonstrating what he wanted the world to be changed into and how it could be changed.Thus, the dramatist's portrayal of the rational reality impacts the illusory reality that the spectator is accustomed to believe, allowing him to view these two distinct realities with arguments, reasoning and logical interpretations. Bertolt Brecht enables his innovative theatrical process to expand and approach the other varied social systems and human conditions along with their specific characteristics, attitudes, beliefs and diversities. Further his theatrical approach explores and reveals the social and human nature whether it is distant culturally enriched east or sophisticated political oriented west. Hence Bertolt Brecht and his rational theatrical approach form a revolutionary opening to a new dimension through which the human social and psychical space are attributed a different altered meaning.

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Original Article

Comparison of *In Vitro* Anticoagulant Activity of Raw, Boiled, and Honey Fermented *Allium sativum* (GARLIC)

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Abstract

Garlic (*Allium sativum*) is one of the medically beneficial spices consumed by Sri Lankan people in different ways. The study aimed to determine the bioactive compounds and *in vitro* anticoagulant activity of aqueous and methanolic extract of raw, boiled, and honey fermented preparations of garlic. Different concentrations of aqueous and methanolic extract of raw, boiled, and honey fermented garlic were prepared by grinding different weights of garlic (2.5×10^{-3} kg for 500 $mgmL^{-1}$, 1.25×10^{-3} kg for 250 $mgmL^{-1}$, 0.25×10^{-3} kg for 50 $mgmL^{-1}$ and 0.05×10^{-3} kg for 10 $mgmL^{-1}$). For aqueous extract, the crude extract had been collected whereas for methanolic extract preparation, maceration had been done. *In vitro* anticoagulant activity was analysed using prothrombin time (PT) of pooled plasma diluted with different concentrations of garlic extract. Bioactive compounds in garlic extracts were analysed by Gas Chromatography-Mass Spectrometry. Methanolic extract of all 3 preparations and aqueous extract of honey fermented garlic had significantly prolonged PT at all concentrations compared to the control ($p<0.05$). Aqueous extract of raw and boiled garlic showed significant prolongation in PT only at high concentrations compared to the control ($p=0.008$). Prolongation in PT was increased with increasing concentration of garlic extract. Honey fermented garlic had the highest prolongation in PT compared to the other two preparations. Moreover, methanolic garlic extract exhibited the a higher prolongation in PT compared to aqueous garlic extract. The content of Dodecanoic acid methyl ester and Methyl tetradecanoate in boiled garlic extract was much higher than in raw garlic extract. Diallyl disulphide, Methyl thiourea and S-Methyl methanethiosulfinate were only found in aqueous raw garlic extract. Beta sitosterol was only detected in methanolic raw garlic extract. All three consumption methods of garlic have an inhibitory effect on blood coagulation. Honey fermented garlic is the most effective preparation for anticoagulant activity.

Keywords: Boiled garlic, Gas Chromatography-Mass Spectrometry, Honey fermented garlic, *In vitro* anticoagulant activity, Raw garlic

Introduction

Garlic (*Allium sativum*, Family: Amaryllidaceae) is a seasoning plant cultivated all over the world. It produces bulbs, each bulb has 5 to 10 cloves. It is utilized as a spice for flavouring food during the cooking process[1]. Garlic is one of the most popular spices used by Sri Lankan people. Moreover, several parts of garlic are used in traditional folk medicine. Leaves and cloves are mostly used for medicinal purposes[2]. Since ancient times, garlic is used to treat cardiac diseases, hypertension, arthritis, respiratory infections, cold, diarrhoea, headache, bites, skin diseases, wounds, ulcers, and tumors[1,3]. Consumption of 1-2 garlic cloves per day is good for health[3].

Garlic contains several bioactive compounds including organosulfur compounds, saponins, phenolic compounds, and polysaccharides. Organosulfur compounds are major compounds found in garlic. There are four major organosulfur compounds which are alliin (S-allyl cysteine sulfoxide), S-allylcysteine (SAC), S-methylcysteine (SMC), and S-ethylcysteine (SEC). Allicin (Diallyl thiosulfinate) is the principal bioactive compound, responsible for most activities of garlic, released by crushing or chopping garlic. The crushing in garlicwhich is released an alliinase enzyme that catalyzes the formation of unstable allicin from alliin. Allyl methyl disulfide (MADS), diallyl sulfide (DAS), diallyl disulfide (DADS), diallyl trisulfide (DATS), E/Z-ajoene, and dithiins found in garlic are produced due to breakdown of allicin[2,4]. Compounds in garlic have several pharmacological properties such as anticoagulant, antimicrobial, antioxidant, anti-inflammatory, anticancer, antidiabetic, anti-obesity, antihypertensive, hypolipidemic, and fibrinolytic activities[5,6].

Garlic has been reported to have an anticoagulant property in many studies. Organosulfur compounds in garlic play a major role in the anticoagulant effect of garlic. Blood coagulation is prevented by allicin in garlic by enhancing fibrinolytic activity and arresting the coagulation system. Fibrinolytic activity is enhanced by increasing tissue-type plasminogen activator (t-PA) which mediates plasminogen activation. The coagulation system is arrested by inhibiting thrombin formation. DADS and DATS in garlic also show antiplatelet activity by resisting thromboxane formation. Ajoene is another important molecule in garlic that prevents platelet aggregation by interfering with presumptive fibrinogen receptors[2]. Allyl methyl trisulfide, vinyldithiins, and other sulfur compounds produced by the breakdown of allicin in garlic bulb also inhibit platelet aggregation and enhance fibrinolytic activity[7]. The fluidity of blood is preserved by Garlic[8]. Due to the above mentioned properties, garlic can be used to reduce the risk of thrombosis[9].

Garlic is consumed by people in raw form or processed form. Even though there are several processed products of garlic are available commercially, boiling, frying, roasting, and fermentation are some commonly used methods at home. *In vitro* platelet aggregation is inhibited by aqueous extract of raw garlic, garlic oil, and other preparations of garlic. Consumption of raw garlic, garlic oil, garlic powder, and aged garlic extract for a long period reduces the platelet aggregation in vivo[10].

This study was conducted to determine and compare the bioactive compounds and *in vitro* anticoagulant activity of aqueous and methanolic extract of raw, boiled, and honey fermented preparations of garlic. Since there are many garlic studies in literature, this comparison study will be useful to determine the most effective preparation of garlic for *in vitro* anticoagulant activity.

Materials and Methods

Study design and setting

Laboratory-based experimental study was conducted at Haematology Laboratory, Department of Medical Laboratory Sciences, Faculty of Allied Health Sciences and Instrument

Center, Faculty of Applied Sciences, University of Sri Jayewardenepura

Preparation of aqueous and methanolic extracts of garlic

Different concentrations of aqueous and methanolic extract of raw, boiled, and honey fermented garlic were prepared by grinding different weights of garlic (2.5×10^{-3} kg for 500 $mgmL^{-1}$, 1.25×10^{-3} kg for 250 $mgmL^{-1}$, 0.25×10^{-3} kg for 50 $mgmL^{-1}$ and 0.05×10^{-3} kg for 10 $mgmL^{-1}$).

The raw, boiled, and honey fermented garlic was ground using a motor and pestle separately by adding 5 mL of distilled water gradually. The extracts obtained were filtered separately using a clean cloth and centrifuged at 2000 rpm for 5 minutes. The supernatant was separated to assess Prothrombin Time (PT). For aqueous extract, the crude extract had been collected whereas for methanolic extract preparation.

Maceration had been used based on previous literature. Methanolic extract was prepared by soaking raw, boiled, and honey fermented garlic in 5×10^{-3} L of methanol separately for 24 hours. The prepared methanolic extracts were evaporated using a water bath at 55ºC for 45 minutes. The residue (gel) that remained in the beakers was redissolved with 5×10^{-3} L of 0.5% (v/v) dimethyl sulfoxide (DMSO)[6] (Figure 1).

Figure 1: Aqueous extracts of raw, boiled, and honey fermented garlic

Preparation of pooled plasma for prothrombin time assessment

Blood was collected into a container whereas 0.5×10^{-3} L of 3.2% trisodium citrate was added. Platelet poor plasma (PPP) was prepared by centrifugation of each sample at 2000rpm for 15 minutes. Pooled plasma was prepared by pooling all the PPP which had normal prothrombin time. The pool was gently mixed and prothrombin time of pooled plasma was measured. Finally, pooled plasma was aliquoted into eppendorf tubes (1×10^{-3} L) and stored in a freezer at -20ºC until processing.

PT value for diluted plasma sample with aqueous and methanolic garlic extracts

An equal volume of pooled plasma and garlic extract of each consumption method were added together to prepare a mixture of 1:1 ratio. PT was measured by using 100×10^{-6} L of mixtures and 200×10^{-6} L of PT reagent separately. The procedure was replicated four times and mean PT was recorded. 0.9% normal saline was used to replace the extract solution for control.

Preparation of sample for Gas Chromatography - Mass Spectrometry

A 500 $mgmL^{-1}$ aqueous extract of raw and boiled garlic were centrifuged at 2000rpm for 5 minutes and the supernatant was mixed with 5×10^{-3} L of 10% NaCl. The above extract solution was then mixed with 10×10^{-3} L of chloroform and supernatant (garlic extract) was separated. It was mixed with 10×10^{-3} L of chloroform two more times and the supernatant was separated and all of three chloroform layers were pooled together. 500 $mgmL^{-1}$ methanolic extract of raw and boiled garlic were centrifuged at 2000rpm for 5 minutes. The supernatant was evaporated in a water bath at 55ºC for 1 hour and the remaining gel was mixed with 30×10^{-3} L of chloroform. Anhydrous Na_2SO_4 was added into chloroform extracts until anhydrous Na_2SO_4 was freely moved. The solution was filtered using a glass syringe with PVDF filter diameter of

s0.22×10^{-6} m into GC-MS vials. Filtration was repeated, until all the water bubbles and particles were removed from the sample and the final volume of filtrate was about about 1×10^{-3} L.

Gas Chromatography Mass spectrometry

The Gas Chromatography Mass Spectrometry (GC-MS) analysis was performed on Agilent 7890A Gas chromatography coupled to 5975C Mass spectrometer with Triple-Axis Detector using a split /splitless inlet with Helium as the carrier gas with 1 mL/min rate. Operating conditions were as follows: HP 5MS column, length 30m, diameter 0.25×10^{-3} m and film thickness 0.25×10^{-6} m, initial temperature of column 90 ºC, injector temperature 270 ºC, total run time 39 minutes, mass range 50-550 m/z, compound identification by NIST database Chemstation® software.

Statistical analysis

All the statistical analysis was conducted by using SPSS version 26.0. Independent sample t-test was performed to find out mean and p-values to compare the prothrombin time values with each consumption method. A p-value of <0.05 was considered statistically significant.

Ethical approval

Ethical approval was obtained from ethics review committee, Faculty of Medical Sciences, University of Sri Jayewardenepura for blood collection (MLS/01/20).

Results

Prothrombin time values obtained with different garlic preparations

The mean PT of pooled plasma was 15.7±1.494s. Aqueous extract of raw and boiled garlic showed significant prolongation in PT compared to control (24.00s) at concentrations of 250 mgmL^{-1} and 500 mgmL^{-1} ($p<0.05$). Aqueous extract of honey fermented garlic showed significant prolongation ($p<0.05$) in PT compared to control at all the concentrations (Figure 2) (Table 1). Methanolic extract of raw and honey fermented garlic showed a significant prolongation in PT compared to control at all the concentrations ($p<0.05$). Similarly, methanolic extract of boiled garlic showed a significant prolongation in PT compared to control at the concentrations of 10 mgmL^{-1}, 250 mgmL^{-1} and 500 mgmL^{-1} ($p<0.05$). The prolongation in PT at the concentration of 50 mgmL^{-1} was not significant (pº0.127) when compared to the control (Figure 3) (Table 1).

Honey fermented garlic showed significantly high PT values compared to raw and boiled garlic in both aqueous and methanolic extracts. (pº0.015 & pº0.011) (Figure 1 & 2). Boiled garlic had significantly high PT values compared to raw garlic in methanolic extract (pº0.015). In aqueous extract, boiled garlic had significantly high PT values compared to raw garlic only at low concentrations, while raw garlic at high concentrations showed significantly high PT values compared to boiled garlic (pº0.011). Methanolic extract of garlic showed a significantly high prolongation in PT compared to aqueous extract with almost all preparations of garlic (pº0.015).

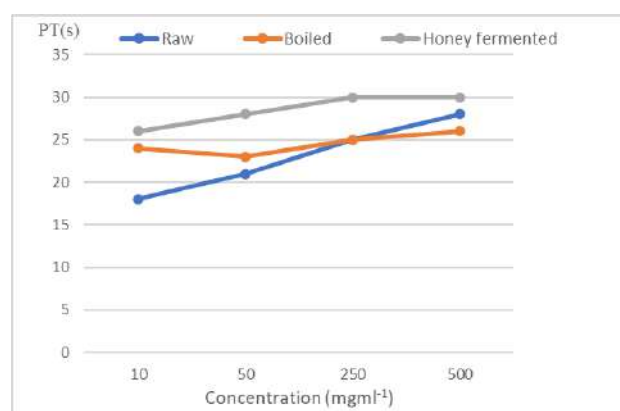

Figure 2: Graphical illustration of median PT against concentration of aqueous extract of garlic

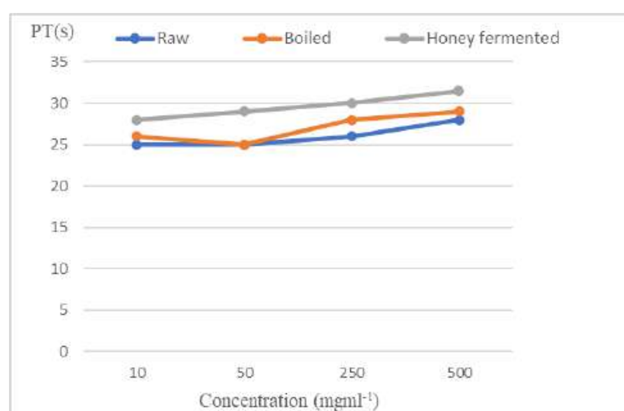

Figure 3: Graphical illustration of median PT against concentration of methanolic extract of garlic

Table 1: Comparison of PT values of garlic preparations with control at different concentrations

Extract	Concentration (mgmL^{-1})			
	10	50	250	500
Aqueous Raw Garlic Extract	P=0.011	P=0.011	P=0.008	P=0.011
Aqueous Boiled Garlic Extract	P=0.317	P=0.011	P=0.011	P=0.008
Aqueous Honey Fermented Garlic Extract	P=0.011	P=0.011	P=0.008	P=0.008
Methanolic Raw Garlic Extract	P=0.040	P=0.011	P=0.011	P=0.011
Methanolic Boiled Garlic Extract	P=0.011	P=0.127	P=0.008	P=0.008
Methanolic Honey Fermented Garlic Extract	P=0.011	P=0.011	P=0.008	P=0.013

Bioactive compounds responsible for anticoagulant activity in different garlic extracts

Bioactive compounds responsible for anticoagulant activity in garlic extracts are given in the table 2.

Bioactive Compounds	Aqueous Raw garlic extract (%)	Aqueous Boiled garlic extract (%)	Methanolic Raw garlic extract (%)	Methanolic Boiled garlic extract (%)
Diallyl disulphide	0.20	-	-	-
Methyl thiourea	0.19	-	-	-
S-Methyl methanethiosulfinate	0.18	-	-	-
Dodecanoic acid methyl ester	0.29	0.55	0.47	0.52
Methyl tetradecanoate	0.34	3.13	1.30	1.68
Beta-Sitosterol	-	-	1.33	-

Discussion

The goal of this study was to describe the *in vitro* anticoagulant activity of aqueous and methanolic extract of raw, boiled and honey fermented preparations of garlic in Sri Lanka. In the current study, a significant prolongation in PT with aqueous raw garlic extract was observed only at high concentrations and the PT was significantly low at low concentrations when compared to the control. This finding deviates from the findings of previous studies in which an increase in PT was observed with aqueous raw garlic extract at very low concentrations (100-500 µgmL^{-1})[11]. This deviation may be due to differences in the method of extract preparation. Prolongation in PT with aqueous extract of raw garlic also was reported in the previous studies[12].

Our results showed a significant prolongation in PT with methanolic extract of raw garlic at all concentrations including at low concentrations when compared to control. Prolongation in PT at low concentrations with methanolic extract of raw garlic also reported in an another study[11].

In our study, significantly high values for PT were observed with all the concentrations of aqueous and methanolic honey fermented garlic extracts compared to the control. The effect of fermented garlic on platelet aggregation was analysed in previous studies. It was found that fermented garlic significantly inhibits *ex vivo platelet* aggregation induced by collagen and adenosine diphosphate (ADP) and also blocks granule secretion[13]. Anticoagulant activity of garlic extract is due to the presence of organosulfur compounds, Dithiins, Saponins, Galactolipid, Phytosterol, and etc[2,14].

In the current study, the compounds which possesses anticoagulant properties were Diallyl disulphide (DADS), Methyl thiourea (MT), S-Methyl methanethiosulfinate (SMMT), Dodecanoic acid methyl ester (DDME), Methyl tetradecanoate (MTD), and Beta-Sitosterol (BS). Furthermore, DDME and MTD were reported in all the extracts. Some previous studies did not report DDME and MTD in the methanolic garlic extract[15]. DADS, MT and SMMT are organosulfur compounds which were detected only in aqueous raw garlic extract in our study. SMMT and DADS were previously detected in the aqueous fresh garlic extract[16]. However, Beta-Sitosterol, was a phytosterol detected only

in methanolic raw garlic extract in this studys, which may be due to its less polarity.

Among the above the compounds which identified in the current study, DADS was reported to have anticoagulant activity in many studies. DADS in garlic show antiplatelet activity by resisting thromboxane formation[2]. Thiosulfinates was reported to have a major role in antiaggregatory activity of garlic by another study[17]. Both DDME and MTD were reported to have an inhibitory effect on blood clotting and preventing stroke and MTD mainly affects platelet aggregation[18]. Platelet aggregation induced by arachidonic acid is retarded by antiplatelet thiourea and novel thiourea compounds which have an effect on platelet aggregation and no effect on coagulation cascade which were reported in previous studies[19]. It was reported in previous studies that Beta-Sitosterol inhibits coagulation factor IIa (Thrombin) and promote thrombolytic activity by triggering plasminogen[20].

The detection of Hexadecanoic acid methyl ester (HDME) in aqueous garlic extract is a new finding reported in this study. It promotes blood coagulation by preventing the fibrinolysis. In previous studies this was detected in methanolic extracts[21].

Our GC-MS findings were supported by prolongation of PT values. In current study, aqueous raw garlic extract showed significantly higher PT than aqueous boiled garlic extract at the concentration of 500 $mgmL^{-1}$ which may be due to the presence of SMMT and DADS. Both compounds have major role in the anticoagulant effect of garlic in aqueous raw garlic extract[17]. Boiling destroys enzyme alliinase, therefore prevent the formation of DADS[22]. In the current study methanolic boiled garlic extract had significantly higher PT value compared to methanolic raw garlic extract which may be due to higher content of DDME and MTD in the methanolic boiled garlic extract when compared to methanolic raw garlic extract. Even though indings of this study revealed significant differences in anticoagulant activity due to boiling, some previous studies reported that boiling of garlic has negligible effect on anticoagulant activity and there was no significant difference between boiled and un-boiled extracts in the prolongation of thrombin induced clotting time[6]. Aqueous raw garlic extract was found to have more effect on inhibition of platelet aggregation induced by collagen than boiled garlic extract[23]. Boiled garlic extract has little effect on TXB_2 synthesis and cyclooxygenase activity in rabbit tissue compared with raw garlic[24]. Boiling for 10 or more minutes reduce the ability of garlic to inhibit platelet aggregation[10].

Even though there were no organosulfur compounds detected in methanolic extract of garlic in our study, highest PT values were observed with methanolic extract of garlic compared to aqueous extract. In the current study, the presence of HDME in aqueous garlic extract may have contributed to reduce the strength of anticoagulatory effect of aqueous garlic extract. The findings of the current study were well supported with similar results which were found study in which plasma incubated with alcoholic extract of *Allium sativum* highly reduced *in vitro* platelet aggregation induced by agonists than aqueous extract[25].

In the current study, honey fermented garlic preparations showed significantly more prolongation in PT than other two preparations. It may be due to the effect of honey on blood coagulation. Flavonoids and hydrogen peroxide in honey have an effect on platelet aggregation. Synthesis of prostacyclin by endothelial cells is triggered by flavonoids. Prostacyclin increases the formation cAMP which blocks GPIIb/IIIa receptors[26]. Flavonoids also interfere with coagulation factors like fibrinogen and factor VII[27]. Fermented garlic has highest effect on the inhibition of platelet aggregation than unfermented garlic[13]. However, In the current study honey fermented garlic was not analysed by GC-MS. Therefore, it will be worthwhile to analyse honey fermented garlic for its scientific validity.

Conclusions

According to the findings of this study, it can be concluded that raw, boiled, and honey fermented garlic preparations have inhibitory effect on blood coagulation while honey fermented garlic has more effective anticoagulant activity than raw and boiled garlic. Further, methanolic extract of garlic exhibited comparatively higher anticoagulant effect than aqueous extract which may be due to high yield of decanoic acid compounds.

Conflict of Interest

There is no conflict of interest

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Original Article

Knowledge and Attitude Towards the use of Contraceptive Methods Among Undergraduates of a Selected Higher Education Institute in Sri Lanka

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Abstract

Unintended pregnancies and sexually transmitted diseases are some of the major reproductive health issues commonly encountered globally. As a developing country in South Asia, Sri Lanka has a prevalence rate of 23-46% of unplanned pregnancies. Two percent (2%) of government clinic attendees are detected with sexually transmitted diseases (STDs) and it is continually increasing among the young population. Poor knowledge, awareness and undesirable attitude towards contraception usage are some of the major factors associated with unintended pregnancies and transmission of STDs. Undergraduates are a vulnerable population to unintended pregnancies and sexually transmitted diseases. Therefore, this study was conducted with the objective of assessing the knowledge and attitudes towards the use of contraceptive methods among undergraduates of KIU. A descriptive cross-sectional study was conducted enrolling 304 undergraduates of 18 to 30 years of age using the simple random sampling method. Data were collected using a pre-tested self-administered questionnaire consisting of socio-demographic details and questions to assess participants' knowledge and attitudes. The knowledge section of the questionnaire was marked out of 34 points, ones who obtained 0-12 marks were considered to have poor knowledge 13-24 as average knowledge and above 25 as good knowledge. The likert scale was used to assess the attitude section of the questionnaire. The results of the study revealed that the majority were females 62.5% (n=190) and 76.32% (n=232) of the study participants were from the age category of 23-27 years. Eighty-four percent (84%, n=255) of the study sample possessed a satisfactory level of knowledge in contraceptive methods and females showed a higher level of knowledge than males (p=0.002). Health science students had a higher level of knowledge than non-health science students (p=0.001). In conclusion, though the study population displays an overall positive attitude towards family planning methods, knowledge in this regard is average.

Introduction

Contraception is a topic that has been used since the dawn of human civilizations (Abdul-Zahra et al., 2016). In simplest terms contraception can be defined as the act of preventing pregnancy (Bansode et al., 2021). Family planning is defined as "a way of thinking and living that is adopted voluntarily, upon the basis of knowledge, attitudes and responsible decisions by individuals and couples" (WHO, 2019). According to WHO, family planning enables individuals to have the number of children they desire with an adequate birth spacing which is accomplished by contraception and the treatment of infertility.

In today's world variety of contraceptive methods are available in forms of medications, devices, procedures or even behaviours which are aimed at preventing conception or interrupting implantations (Bansode et al., 2021; Rakhi & Sumathi, 2011). Contraceptive methods prevent unintended pregnancies and also provide additional benefits of preventing maternal/infant morbidity and mortality, unsafe abortions, transmission of sexually transmitted diseases (STDs) which ultimately contribute to the economic and social well-being of a country (WHO, 2019). Despite the existence of a variety of safe contraceptive methods with evidence of their benefits, there still exists a gap in the knowledge, attitude, and practices regarding contraception (Gothwal et al., 2017). Therefore, unintended pregnancies and sexually transmitted diseases have become one of the major reproductive health issues commonly encountered by individuals globally (Akintade et al., 2011). Global estimates reveal that over 210 million pregnancies occur each year, but 75 million (or almost 36% of the 210) are unintended or undesired births (Gbagbo & Nkrumah, 2019). According to Akintade et al., (2011) in underdeveloped nations, the number of young women reporting unwanted pregnancy is high. As a developing country in South Asia, Sri Lanka also has a prevalence rate between 23-46% of unplanned pregnancies within the country (Ranatunga & Jayaratne, 2020) and the prevalence of STDs among Sri Lankan youth was found to be increasing (Batagalla & Manathunge, 2020). Poor knowledge, awareness and undesirable attitude towards contraception usage are some of the major factors associated with unintended pregnancies and transmission of sexually transmitted diseases (Semachew Kasa et al., 2018). Undergraduates could be considered as an educated group of individuals who are the future of a country's development. Therefore, it is important to assess the knowledge and attitude towards contraception methods among undergraduates to provide them with the information and attitudes that they need regarding contraceptive methods to make responsible decisions in their life, which ultimately benefit social as well as the economic aspects of the country.

Methodology

A descriptive cross-sectional study was conducted at KIU, Sri Lanka; enrolling 304 undergraduates aged between 18 to 30 years using random sampling method. The sample size was calculated using Yamane formula (Adam, 2020). Data were collected using a pre-tested self-administered online questionnaire and it was distributed using students' emails. The questionnaire consisted of three sections with 40 questions. The first section consisted of socio demographic details. The seconf section included 27 questions to assess the knowledge of the participants regarding family planning methods and a total of 34 marks were given for participants who answered all the questions. The ones who scored 0-12 marks were considered to possess "poor"knowledge, while ones who obtained 13-24 were considered to possess "average" knowledge and those who scored 25 or above were considered to possess "good" knowledge regarding family planning methods according to Bloom's cut-off values.

The third part of the questionnaire consisted of 18 questions. Likert scale was used to assess the participants' attitudes toward the family planning method.

Ethical approval was obtained from the ethics review committee of KIU (KIU/ERC/21/197) and informed consent was taken from every participant. Data analysis was done using a statistical package for social sciences software (SPSS version 25). Descriptive statistics such as frequencies, percentages, means, standard deviations and statistical tests such as independent t-test, One-way ANOVA, Chi-square test were used for the data analysis

Results

Out of the total 304 participants majority were females (62.5%, n=190). Seventy-six-point three two percent (76.32%, n=232) of the study participants were from the age category of 23-27 years. Forty-one-point eight percent (41.8%, n=127) were non-employed while 36.2% (n=110) were employed and from the employed participants 22.0% were training as interns. The majority (45.1%, n =137) of the participants were from the department of Biomedical science. Further, (73.7% n=224) of the undergraduates were pursuing a degree in the study area of health sciences (Medical Science in Acupuncture, Bio-Medical Science, Nursing, Psychology) while the rest were pursuing (26.3%, n=80) a non-health science degree (Management) (table 1).

Table 1: Socio-demographic characteristics of the study participants

Socio-demographic factors		Frequency	%
Age	18-22	45	14.8
	23-27	232	76.32
Age	28-30	27	8.88
Gender	Female	190	62.5
	Male	114	37.5
Study area	Health science	224	73.7
	Non – health science	80	26.3
Study program	Med. Sc. Acupuncture	4	1.3
	BMS	137	45.1
	Nursing	34	11.2
	Psychology	49	16.1
	Management	80	26.3
Current year of study	1st year	66	21.7
	2nd year	37	12.2
	3rd year	84	27.6
	4th year	117	38.5
Province	Central Province Eastern province	20	6.6
	Eastern province	17	5.6
	North Central Province	6	2.0
	North-western Province	16	5.3
	Northern province	5	1.6
	Sabaragamuwa province	28	9.2
	Southern province	26	8.6
	Uva province	19	6.3
	Western province	167	54.9
Employment status	Employed	110	36.2
	Training	67	22.0
	Non- employed	127	41.8

Statistically significant associations were observed between knowledge of participants and each of the variables namely the age (p=0.001) (cl=95%), gender (p=0.008), study program (p=0.001), province (p=0.002), current year of the study (p=0.001), employment status (p=0.009) and study area (p=0.001).

A value of 0.757 was used as the Cronbach's Alpha value with a "Good" internal consistency. Out of the 304 study participants, 72.7% (n=221) participants possessed an average knowledge regarding contraceptive methods while 16.1% (n=49) and 11.2% (n=34) possessed a poor level and good level of knowledge respectively regarding the contraceptives (table 02).

Table 2: Knowledge regarding contraceptive methods

Knowledge	Frequency	Percentage
Average	221	72.7
Good	34	11.2
Poor	49	16.1

The mean knowledge between male and female students were 17.24±5.55 and 19.13±4.89 respectively. A statistically significant difference in the level of knowledge was observed between the male and female students (p=0.002) towards the use of contraceptive methods. Therefore, among the study participants, female students possessed a higher level of knowledge regarding contraceptive methods than male students.

In addition, a statistically significant difference in the knowledge towards contraceptive methods was observed between the study areas of health science and non-health science students (p=0.001). The mean knowledge of health

science students and non-health science students was 19.96±4.60 and 14.10±4.37 respectively (Table 2) (figure 2).

Table 3: Mean knowledge values of different study programs

1	Bio-Medical Science	19.85±4.77
2	Med. Sc. Acupuncture	26.25±2.50
3	Management	14.10±4.37
4	Psychology	19.20±4.59
5	Nursing	20.76±3.46

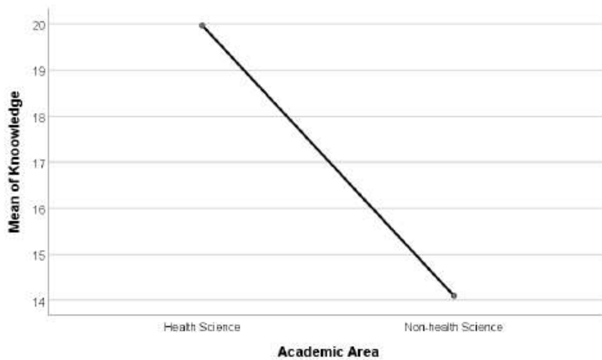

Figure 2: Mean plot between study area and knowledge

A statistically significant difference in knowledge score among students who are following different academic programs (F (4,299) = [27.707], (p=0.001) was observed using the one-way ANOVA test. Turkey's HSD Test for multiple comparisons found that the mean value of knowledge was significantly different between the study program (Management) and itself as well as all the other study programs (Table 3) (Figure 3).

Table 4: Multiple Comparisons

Dependent Variable: Total

Tukey HSD

(I) 1.3. Study program	(J) 1.3. Study program	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
BMS	Med.Sc. Acupuncture	-6.396*	2.279	.042	-12.65	-.14
	Management	5.754*	.632	.000	4.02	7.49
	Psychology	.650	.748	.908	-1.40	2.70
	Nursing	-.911	.861	.828	-3.27	1.45
Med.Sc. Acupuncture	BMS	6.396*	2.279	.042	.14	12.65
	Management	12.150*	2.302	.000	5.83	18.47
	Psychology	7.046*	2.336	.023	.63	13.46
	Nursing	5.485	2.375	.145	-1.03	12.00
Management	BMS	-5.754*	.632	.000	-7.49	-4.02
	Med.Sc. Acupuncture	-12.150*	2.302	.000	-18.47	-5.83
	Psychology	-5.104*	.815	.000	-7.34	-2.87
	Nursing	-6.665*	.920	.000	-9.19	-4.14
Psychology	BMS	-.650	.748	.908	-2.70	1.40
	Med.Sc. Acupuncture	-7.046*	2.336	.023	-13.46	-.63
	Management	5.104*	.815	.000	2.87	7.34
	Nursing	-1.561	1.003	.527	-4.31	1.19
Nursing	BMS	.911	.861	.828	-1.45	3.27
	Med.Sc. Acupuncture	-5.485	2.375	.145	-12.00	1.03
	Management	6.665*	.920	.000	4.14	9.19
	Psychology	1.561	1.003	.527	-1.19	4.31

*. The mean difference is significant at the 0.05 level.

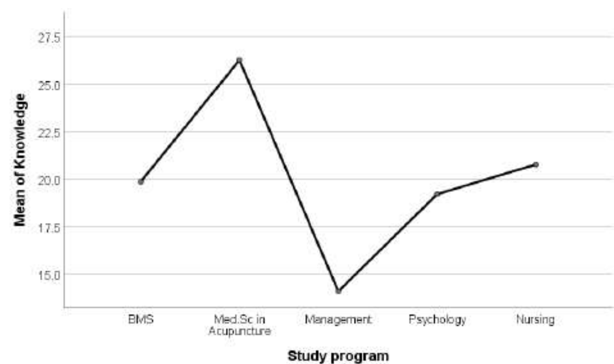

Figure 3: Mean plot between study program and knowledge

Students following the study program of medical science in acupuncture possessed the highest mean level of knowledge regarding contraceptive methods (26.25±2.50) while students following the study program of management possessed the lowest mean knowledge regarding contraceptive methods (14.10±4.37).

It was found that majority of the students (68.4%, n=207.9) possessed a favourable attitude towards the use of contraceptive methods. In assessing attitudes towards contraceptive methods, 84.9% (n=258) of undergraduates selected health care centers as the best place to get contraceptive services. Fifty six point nine percent of the participants (56.9%, n=173) selected "condoms" as the contraceptive method, which can possibly be the most popular in Sri Lanka. Further, 51.97% (n=157) of participants had a favorable attitude towards regular oral pills while 26.64% (n=80) had a favorable attitude towards emergency oral pills. Majority of the students (78.7%, n=239.24) agreed that

it is a requirement to possess knowledge about the use of contraceptives. Seventy five percent (75%, n=228) of the students agreed that some contraceptive methods help to reduce sexually transmitted diseases.

Discussion

Contraception is an important topic to be addressed in the contemporary world with its ability to bring about increased health, social and economic benefits to individuals, families, communities and societies (Hock- Long et al., 2003). Methods of contraception aid individuals and couples to avoid unintended pregnancies and achieve their desired number of children with a preferred spacing between births while enhancing the maternal health, infant and child survival. Further, they prevent and reduce the transmission of STDs, decrease the number of legal or illegal abortions, slow down the growth rates of populations and empower women with an increased sense of autonomy regarding their life decisions (Butler & Clayton, 2009; Mahadeen et al., 2012; Mahaini & Mahmoud, 2005). Furthermore, World Health Organization stresses the importance of providing comprehensive and thorough education regarding sexuality for the younger population in order to prepare them to lead secure, productive, and fulfilling lives in a world where sexually transmitted diseases, unplanned pregnancies, gender-based violence, and gender discrimination are highly prevalent (Herat et al., 2019).

In assessing knowledge towards contraceptive methods among undergraduates in KIU, the current study observed that 83.9% of the study participants possessed an adequate knowledge regarding contraceptive methods. Statistically significant difference was found in the level of knowledge between male and female students (p=0.002) and female students possessed a higher level of knowledge than male students did. The possession of better knowledge regarding contraceptive methods among females is further confirmed by a similar study conducted by Abdul-Zahra et al., (2016) in Iraq. However another study conducted among undergraduates in Sri Lanka contradicts the present study findings as it showed male undergraduates had better knowledge of contraceptive methods (77.5%) compared to female undergraduates (18%) (Herath et al., 2008).

The results of the study further revealed that studying in the area of health sciences was a significant factor associated with possession of an adequate knowledge regarding contraceptive methods. Further, the mean knowledge levels of health science students were found to be higher (19.96±4.607) than the non-health science students (14.10±4.37) which is consistent with the findings of a similar study conducted in Sri Lanka in which undergraduates who were following a bioscience degree program had good knowledge regarding contraception than other students (Perera & Abeysena, 2019).

The study also shows that the majority of the participants expressed a positive attitude towards contraceptive methods. Current study further observed that most of the undergraduates (84.9%) thought that health care centers are the best place to get contraceptive services. This is in line with findings reported in studies conducted by Gothwal et al., (2017) and Tilahun et al., (2013)

Condoms offer protection from both sexually transmitted diseases as well as pregnancy (Perera & Abeysena, 2019). Correct and regular usage of condoms is considered as one of the best approaches to prevent the HIV transmission in both local and international contexts (National STD/AIDS Control Programme, Ministry of Health & Medicine, Colombo, 2016). In the present study, condoms were chosen by 56.91% of the participants as the contraceptive method, which can possibly be the most popular in Sri Lanka, followed by regular oral pills (51.97%) and emergency oral pills (26.64%). According to Thalagala & Rajapakse, (2004), condoms (29%) were also the most popular contraceptive method followed by pills (24%) among adolescents in Sri Lanka.

Conclusion

In conclusion, the present study population possessed an average knowledge regarding contraceptive methods. With regards to the area of study, there is a significant difference in knowledge levels between health science and non-health science undergraduates and also their currently pursuing study program has also impacted the level of knowledge they possess regarding contraceptive methods. The student also displayed an overall favourable attitude towards the use of contraceptive methods. Assessing the level of knowledge and attitudes toward family planning methods are equally important for other age categories such as adolescents and adults. Further studies should be carried out to assess the knowledge and attitudes towards family planning methods in different age groups and required educational sessions and awareness programs to raise the level of knowledge among such age categories.

Conflicts of Interest:

Authors declare that no conflicts of interest

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Original Article

An overview of water quality within the Colombo Municipal Council area; A retrospective report analysis

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Abstract

Access to safe and quality drinking water is a fundamental requirement and a basic human right. Water quality is determined by its biological, physical, and chemical properties. Colombo Municipal Council (CMC) area consists of the largest population who utilize pipe-borne water supplied by the National Water Supply and Drainage Board (NWS&DB) Sri Lanka. The objective of the study was to assess the water quality of the drinking water under selected parameters within the Colombo Municipal Council area. In this quantitative, retrospective, cross-sectional study, 268 water analysis reports from 1st July to 30th November 2021 were considered with the permission of the Ethics Review Committee of KIU (KIU_ERC_21_194A) and relevant authorities of NWS&DB. Data on selected parameters such as color, turbidity, pH, Total Dissolved Solids (TDS), Free Residual Chlorine (FRC), the total number of coliform bacteria, and the total number of *Escheretia-Coli* (*E-Coli*) were extracted. Data analysis was done using SPSS (Version 25). All values were considered based on reference ranges of Sri Lanka Standards (SLS) guidelines. The study indicated that, among nine water schemes and four water reservoirs, the highest contributions for purification were from the Maligakanda water scheme (15.9% n =56) and Maligakanda water reservoir (51.6%, n=139). All the samples were fully treated water and the mean of the color was 4.03 Hazen Units which was within the permissible level, though (3.7 % n=10) of samples exceeded the range. The mean value of the turbidity was 0.49 Nephelometric Turbidity Unit (NTU) which was within the permissible level and only one sample had deviated from the maximum permissible level. The mean pH value was 7.33 and except for one, all other samples were within the permissible level. The mean value of the TDS was 24.51mg/L and the majority (95.8 %, n= 257) of FRC values varied between 0.6-0.8mg/L which was within the permissible level, while 3.39% (n=10) of samples had 0 mg/L. All samples were free from coliform and *E-Coli*. Most of the samples were within the permissible range of color, pH, turbidity, TDS, FRC, and free from Coliform and *E-Coli* which can be recommended for use.

Keywords: Water quality, Safe drinking water, SLS guidelines, Microbial contamination, Hazen Units, Nephelometric Turbidity Unit, pH Value

Introduction

Water is one of the most important substance on earth and consists of hydrogen and oxygen as chemical elements. Water exists in gaseous, liquid, and solid states, and water is essential for living organisms (plants, humans, animals, and microbes) for their survival. If there is no water, there would be no life on earth. It is a magical liquid and the main reason for the existence of living beings on earth. It is one of the most plentiful and essential compounds. Water is a tasteless odorless and colourless liquid at room temperature with the important ability to dissolve many other substances. Water involves in many important functions including regulating body temperature, flushing out waste from the body through perspiration, urination, and defecation, protecting tissues, spinal cord, and joints by lubricating and cushioning, preventing constipation, assisting in digestion, absorption of nutrients, assisting in oxygen circulation via blood (Silver, 2020). Therefore, to regulate bodily functions at an optimum level one needs to have an adequate daily intake of quality water.

Access to safe drinking water is a fundamental requirement for good health, a human right, and a major public concern. Global access to safe drinking water is monitored by the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) (Bain et al., 2014). Water quality is determined by assessing three classes of attributes, namely biological, chemical, and physical. There are standards to assess water quality for each of these three classes, some are considered of primary importance and others are of secondary importance. Primary water standards regulate organic and inorganic chemicals, microbial pathogens, and radioactive elements that may affect the safety and quality of drinking water (Sivaranjani et al., 2015). Poor water quality can cause health risks for people and risks for ecosystems. In addition, the need for sustainable urban water supplies requires that the quality of existing available water resources as well as their watersheds need to be under continuous monitoring. Besides, the level of treatment required for human consumption, agriculture, animal husbandry, and industry necessitates an understanding of the quality of source waters. In this way, at the beginning of the twentieth century, the importance of water quality has to be considered and the concentration of chemicals in sewage and industrial discharges in waterbodies needs to be controlled (Gholizadeh et al., 2016).

According to the estimation of WHO, almost 10% of the population around the world does not have proper access to quality drinking water. Therefore, WHO has included water quality as one of the sustainable development goals of the United Nations (UN) to ensure universal access to water and sanitation by 2030 (WHO, 2008). Therefore, interventions to improve the quality of drinking water provide significant health benefits by improving awareness and access to safe drinking water (Aryal et al., 2012). Therefore every effort should be made to achieve drinking water quality as safe as practicable.

Obtaining safe drinking water is one of the major issues among individuals who are living in South Asian countries as well as contamination of drinking water is considered a major burden on human health. Diarrheal diseases due to the consumption of micro bacterial contaminated drinking water and Chronic Kidney Diseases (CKD) due to the consumption of drinking water contaminated by Arsenic (As) are the major problems in the Sri Lankan population (Jayasumana et al., 2013). Those at great risk of water-borne diseases are infants, young children, people who are living under poor sanitary conditions, and elderly people (Ellawala & Priyankara, 2016).

Parameters of drinking water quality mainly included color, turbidity, pH value, TDS, FRC, the total number of coliform bacteria, and the total number of E-Coli. Deviation of each parameter of water quality adversely affects all living organisms.

The Color of the drinking water is determined by the Platinum-Cobalt Scale (also known as a Pt/Co scale or an Apha-Hazen Scale) ranging from 0 to 500 with the lowest value at "0" referring to water as white or "distilled". It measures "yellowness" in liquid based on dilutions of 500 parts per million (ppm) platinum cobalt solution. This color index is a method for evaluating pollution levels in water or wastewater along with determining product quality and impurities. A 500 value on the scale means the water is distinctly yellow (Spartan, 2022). The drinking water samples which exceed 15 Hazen Units in color are not recommended for utilization according to the SLS guidelines (SLS, 2013).

Turbidity is not a major health concern. However high turbidity can interfere with the disinfection, water treatment process, and contamination. Normal pH values of the drinking water lie within the range of 6.5 – 8.5. It is not recommended to drink acidic water, as its high acidity and concentration of heavy metals could have several negative health consequences including poisoning or toxicity. Additionally, the acidity of the water can erode tooth enamel, and cause itchy skin or irritability in the gastrointestinal tract. Alkaline water doesn't pose any serious health risks. However high pH could make skin dry and itchy or cause damage to the lining of the stomach (WHO, 2007).

Total Dissolved Solids (TDS) is a measurement of the number of dissolved ions in water. It predominantly comprises inorganic salts. However, elevated levels of specific ions included in the TDS measurement such as nitrate, arsenic, aluminum, copper, or lead could produce health risks (WHO, 2007).

Although chlorine reduces the infectious risk, recent studies show that chlorine in treated water is dangerous to human health due to the possibility of developing allergic symptoms ranging from skin rash to intestinal symptoms, and arthritis and destroying protective lactic acid bacteria in the colon, which strengthens the mucosal immune response against foreign pathogens in the intestine (Sheikhi et al., 2014).

According to the WHO, the mortality of water-associated diseases exceeds 5 million people per year. In general terms, the greatest microbial risks are associated with the ingestion of water that is contaminated with human or animal feces. Wastewater discharges in fresh water and coastal seawater are the major sources of fecal microorganisms, including pathogens. Acute microbial diarrheal diseases are a major public health problem in developing countries (Cabral, 2010). The Total Coliforms (TCs) and *Escherichia coli* are used as indicators to detect the fecal contamination of drinking water (Aryal et al., 2012). According to a report on drinking water by WHO, water for human consumption should be free from any disease-causing microorganisms per 100 mL of water (Osiemo et al., 2019).

The government of every country is primarily responsible for providing clean and safe drinking water to people. In the Sri Lankan context, National Water Supply & Drainage Board (NWS&DB) is the main government organization responsible to provide safe piped-borne water in Sri Lanka. The NWS&DB supplies water to 34% of the country's population, while local authorities and community water supply schemes account for another 10%. Most of the cities and their suburbs are supplied with treated water by NWS&DB. People who are living in rural areas use their own water supplies, most frequently sourced from groundwater such as shallow wells and deep wells. People who are living in the dry zone of Sri Lanka, use water in irrigation tanks for bathing and household consumption (Ellawala & Priyankara, 2016).

It is essential to assess the quality of drinking water regularly according to the recommended guidelines. When assessing the water quality, there are recommended guidelines by WHO and Sri Lanka Standard Institute (SLS) guidelines (SLS, 2013) that are suitable for the Sri Lankan setting. NWS&DB of Sri Lanka follows the SLS guidelines when checking the quality of drinking water (NWSDB, 2020)

Colombo Municipal Council (CMC) area consists of 592,872 population and 47 administrative districts (Department of Census and Statistics, 2020). When considering this population 99% of them utilize pipe-borne water which is supplied by NWS&DB (NWSDB, 2020).

Based on these concerns, it is important to assess the quality of drinking water in the CMC area because it is one of the largest populations that utilize pipe-borne water which is supplied by the National Water Supply and Drainage Board (NWS&DB) Sri Lanka. Ambathale water treatment plant is one of the main center where the water treatment takes place in Sri Lanka and it is the water resource center for the CMC which is supplied by the Kelani River. The major reservoir tanks which are located in Maligakanda, ElliHouse, Dehiwala, and Jubilie are supplied by Ambathale treatment plant and distribute purified water around the CMC area (NWSDB, 2020)

Before providing water to the CMC, water quality parameters are detected at several pre-determined end-points located in Thimbirigasyaya, Pamankada, Hultsdrop, Mattakkuliya, Borella, Slave Island, Maligakanda, Kotahena, and Maligawatta. However it may be contaminated through various means when reaching the endpoint consumption hence, the current study was conducted to assess the water quality under selected parameters within Colombo municipal council area.

Methodology

A descriptive, retrospective, cross-sectional study was carried out using the secondary data extracted from 268 water analysis reports which were obtained from the Central laboratory of the National Water Supply & Drainage Board Rathmalana from the 1st of July to the 30th of November 2021, representing all 47 administrative districts of the CMC area of Western Province, Sri Lanka. The initial calculated sample size using the Daniel Formula was 385. However, researchers could not have direct access to the water schemes, since this research was done during the Covid-19 pandemic. Therefore, 268 water analysis reports which were obtained from the Central Laboratory in Rathmalana were considered secondary data of the current study.

All water samples (100%) that were used in this study were analyzed by NWS&DB and were fully treated water. The data were collected using a data extraction sheet which was developed by researchers referring to scientific literature. The data were analyzed using Microsoft Excel and SPSS version 25. Data are presented as descriptive statistics, such as frequencies, means, and standard deviations.

Ethical clearance was obtained from the Ethics Review Committee of KIU (ERC number KIU/ERC/21/194_A) and special approval and consideration have been obtained from the chief chemist of NWS&DB Maligakanda. The confidentiality of the data was maintained during the research process.

Results

The majority of water samples were collected from Maligakanda schemes15.9% n=56) followed by Thimbirigasyaya (14.2%, n=50,) Slave Island (9.9%,n=35,) and Pamankada (9.4% n=33) respectively. The rest of the samples are tabulated in Table 01. The majority of samples were distributed by the Maligakanda reservoir within the CMC area, of which 51.6% (n=139) and 24.2% (n=65) were distributed by the ElliHouse reservoir (Table 2).

Table 01: Frequency of samples based on water schemes

Scheme	Frequency	Percentage (%)
Thimbirigasyaya	50	14.2
Pamankada	33	9.4
Hultsdrop	25	7.1
Mattakkuliya	11	3.1
Borella	31	8.8
Slave Island	35	9.9
Maligakanda	56	15.9
Kotahena	11	3.1
Maligawatta	17	4.8

Table 02: Frequency of samples based on water reservoir

Reservoir	Frequency	Percentage
Jubilie	28	10.4%
Dehiwala	37	13.8%
Maligakanda	139	51.6%
ElliHouse	65	24.2%

Color

The mean value for color was 4.03 (± 4.55) Hazen Units. The majority (96.18% n=258) of samples were within permissible levels of SLS guidelines, while 27.9% (n= 75) samples indicated 0 Hazen Units referring to water as distilled. Ten samples that were collected from Maligakanda, Thimbirigasyaya, Slave Island, and Borella schemes exceeded the maximum permissible level of 15 Hazen Units within the data collection period.

Turbidity

The mean value for the turbidity was 0.49 (±1.48) NTU. The majority of samples (98.8% n=265) were within the maximum permissible level of 2 NTU according to the SLS guidelines. Only one sample which was collected from the Maligakanda scheme deviated from the permissible level and was 23.6 NTU. Another two samples which were collected from Thimbirigasyaya and Borella schemes slightly exceeded the permissible level.

pH

The mean value for the pH was 7.33 (±0.97). Except for one sample, other samples (99.6% n=267) were within the permissible level of 6.5 to 8.5 according to the SLS guidelines.

Total Dissolved Solids (TDS)

The mean value of the TDS was 24.51 (±4.12) mg/L. All the samples (100% n= 268) were within the permissible level of 500mg/L according to the SLS guidelines and the majority of samples were within 23 to 24.4mg/L.

Free Residual Chlorine (FRC)

The majority of samples (95.8% n=257) were within 0.6 to 0.8 mg/L for FRC. The maximum acceptable FRC level according to the SLS guidelines is 1mg/L. Eleven samples collected from Borella, Slave Island, Pamankada, Thimbirigasyaya, Maligakanda, and Hulstdrop had 0 mg/L for FRC. Only one sample indicated FRC as 0.1mg/L which was below the minimum recommended level of 0.2mg/L for treated drinking water by WHO.

Total coliform and E-Coli

All the samples were free from total Coliform bacteria and *E-Coli*. SLS guidelines describe that *E-Coli* or thermotolerant coliform bacteria shall not be detectable in any 100ml of the water samples and further total coliform bacteria shall not exceed 03 in any 100ml of the water sample.

Discussion

The study considered 268 water analysis reports regarding characteristics such as color, turbidity, pH, Total Dissolved Solids (TDS), Free Residual Chlorine (FRC), the total number of coliform bacteria, and the total number of E-Coli. In the current study, the mean value of the color of water samples was 4.03 Hazen Units which was within the permissible level of WHO specification (5-50 Hazen Units). Ten samples exceeded the permissible level which was not preferred for drinking purposes. A similar study was done in the Kalatuwawa water treatment plant and after the treatment process, the average color was indicated as 0 Pt/Co (similar to the Hazen unit) Units which was within the WHO limits (Premaratne & Senarathne, 2017). Both studies indicate similar results on the color of the water after the treatment showing that the treatment process in Sri Lanka conforms to recommended levels. Another Australian study also indicated the same finding as their results were also

within the permissible level as recommended by WHO (Senevirathna et al., 2019) showing that the methods used in treating water in Sri Lanka are adequate. However alarmingly in the current study ten samples (3.7%) exceeded the permissible level which cannot be recommended for usage. This observation was not detected in previous studies locally and internationally. This highlights the need to evaluate the treatment procedure in the Sri Lankan context as previous studies done in Sri Lanka have conformed to the standard. The recommended turbidity levels were seen in the current study and previous studies done locally and in the Australian study, This finding is a positive factor for the treatment process storage and delivery of drinking water in Sri Lanka.

In the current study, the mean value of pH was 7.33 and was within the permissible level of the SLS specification of 6.5-8.5. Only one sample was 6.45 which exceeded the permissible level. In a similar study in 2014 done in the Kelani River basin, the pH values varied between 4.36 and 8.98 which exceeded the SLS and WHO guidelines and indicated a significant difference in pH variant compared to the current study (Mahagamage, & Manage, 2014). A pH variation is due to chemicals minerals pollutants soil mixing etc and it can be inferred that in the 2014 study the variation in pH could have been due to contamination. However, in the current study contamination seems to be minimal.

In keeping with the results of this study, another study conducted in selected water resources in Giradurukotte indicated the same results as the current study where the pH of groundwater and surface water varied between 6.56-7.72 and 6.88-7.51 respectively according to the SLS guidelines which are suitable for drinking (Kumari et al., 2016).

When comparing the Giradurukotte study with the current study Total Dissolved Solids (TDS) value varied between 0 mg/L to 41.7 mg/L and 65.9 mg/l to 311 mg/l and 40.2 mg/l to 141.53 mg/l respectively for the shallow wells and surface water bodies. Both values did not exceed the maximum permissible level of SLS specification of 500mg/L, even though the Giradurukotte study indicated a slightly higher amount than the current study (Kumari et al., 2016). Another study conducted in India also showed that values are within the recommended range of WHO (Sharma & Rout, 2011).

In the current study, the majority of the samples did not exceed the maximum permissible level for FRC according to the SLS specification of 1mg/L through 11 samples had 0 mg/L which gave rise to the risk of contamination by coliform bacteria. A similar study was done in the Riyadh region in Saudi Arabia, which recorded an FRC between 0.2 and 0.5mg/L which was a permissible level according to the Saudi Arabian Standards and had very lesser risk compared to the current study findings (Al-Omran et al., 2015)

In the current study, all samples were free from Coliform bacteria according to the SLS guidelines as 0cfu/100ml for the desired level and 03cfu/100ml for the permissible level at 37^0C (SLS, 2013). A similar study conducted in western Nepal indicated the presence of total coliform in 86.90% of the total samples which were taken from a natural source, reservoir, and tap water which shows a significant difference between the current study (Aryal et al., 2012). In the current study, all samples were free from E-Coli according to the SLS guidelines as 0cfu/100ml for the desirable and permissible level at 44^0C (Sri Lanka Standard 614:2013, 2013). Further similar results were shown by another study conducted in Australia on the presence of E.coli and coliforms (Seneviratne et al., 2012).

Conclusion

Pipe-borne treated water in Sri Lanka is suitable for human consumption

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Case Report

Acupuncture for treating adhesive capsulitis (frozen shoulder): A Case report

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Abstract

This case study discloses acupuncture treatment performed on a patient who presented with adhesive capsulitis (frozen shoulder) for a period of 4 months. After 15 treatment sessions which also included two sessions of acupuncture, the patient was pain free and achieved a full range of motion of the glenohumeral joint.

Key Words: adhesive capsulitis, frozen shoulder, acupuncture

Introduction

Frozen Shoulder (FS) is a typical yet misunderstood problem that affects the glenohumeral joint and is postulated to be caused by a non-specific chronic inflammatory reaction that affects the subsynovial tissue, resulting in capsular and synovial thickening (Asheghan et al., 2016; Sun et al., 2001). It is a limitation of shoulder mobility that is not caused by joint surface abnormalities, fractures, or dislocation that usually develops gradually and is idiopathic, although it can sometimes occur suddenly and be linked with a history of mild shoulder joint injury (Ben-Arie et al., 2020).

Adhesive capsulitis is a medical term that refers to a condition rather than a diagnosis. As implied by the alternate titles, frozen shoulder, periarthritis, pericapsulitis, sticky capsulitis, and obliterative bursitis, it is most commonly used as a clinical phrase with pathogenetic connotations (Ben-Arie et al., 2020; Sun et al., 2001). The condition mostly affects middle-aged individuals and is typically self-limiting, however the length and severity might vary significantly (Sun et al., 2001). The clinical appearance of FS is characterized by pain and a restriction in the range of active and passive mobility of the shoulder. Pain can be intense, which can make sleeping exceedingly difficult. Range of motion (ROM) is often more restricted with external rotation but less so with abduction and internal rotation (Shaffer et al., 1992; Sun et al., 2001; Waldburger et al., 1992). We report a patient with FS with decreased range of motion.

Case Report

A 62-year-old female housewife was observed with pain in the left shoulder characterised by restriction of shoulder mobility in both active and passive motion with abduction and flexion for 4 months. She expressed a pricking and achy discomfort in her left shoulder that radiated down the left arm. Further, it influenced daily chores like cooking, sweeping and gardening. On examination, it was observed that any movement of the left upper limb intensified her agony and that the pain kept her awake at night. Further, the pain was alleviated significantly when a hot compression was applied. She also claimed that she felt comfortable while submerged in a hot water bath. The main diagnosis was in the left glenohumeral joint active range of motion (ROM). The ROM measured were as follows: Internal rotation 15°, external rotation 10°, forward flexion 30°, extension 20°, and abduction 30°. The grade for redistricted movement in the left glenohumeral joint for flexion, abduction, and internal and external rotations was 2/5. The patient's motions of the left glenohumeral joint's posterior and posteroinferior joints were also restricted, uncomfortable, and painful.

Treatment of Acupuncture

The following acupuncture points were employed for treatment: Strong lifting and thrusting stimulation were applied to taner point, St38 (Tiaokou), Gb41 (Foot-linqi) and Ah-shi points for acute pain. Liv3 (Taichong), Li4 (Hegu) were needled to in a reduction method and Gb34 in an even method. K6 (Zhaohai), K3 (Taixi), Ren12 (Zhongwang), St36 (Zusanli), Ren6 (Qihai) were needled in a tonification method. These acupoints were chosen in the treatment of FS based on TCM principles. Aquapuncture was utilised on the patient twice in the whole session in addition to standard acupuncture needling. Aquapuncture was done by injecting a small amount of less than 0.1ml of sterile distilled water into Taner point and Ah-shi points.

Acupuncture treatment was done by introducing sterile stainless-steel needles (size: 0.25x0.25) into the muscle layer of the patient. The needles were rotated clockwise forcefully for the reduction method and counter-clockwise with a little force for the tonification method for one to two minutes within every ten minutes, and the needles were kept for 30 minutes. For five weeks, this treatment was given three times per week (15 treatment sessions). Within the entire treatment period, the patient was also given aquapuncture at Taner extra point and at Ah-

shi point twice. All needle placements were done by qualified Acupuncture practitioners at the KIU Acupuncture Clinic in Koswatta, Sri Lanka. Furthermore, the patient was informed about acupuncture treatment for FS and related desirable therapeutic outcomes.

Clinical Outcome

After the patient underwent 3 weeks of treatment, the active left glenohumeral abduction, flexion, and external rotation were 50°, 70°, and 15° (30°, 30° and 10° initially), whereas the passive abduction, flexion, and external rotation were 75°, 80°, and 35° respectively. After undergoing treatment for further 2 weeks, there was a remarkable relief in pain and the patient was able to obtain a full range of motion.

Discussion

The acupuncture treatment employed in this clinical study was carried out in accordance with Traditional Chinese Medicine (TCM) principles. “Qi”, or energy, is considered to flow along a complex of linked channels known as meridians. “Qi” connects the meridian systems where each internal organ is supposed to be related to a certain meridian, which is named after the organ in consideration. Diseases and discomforts, such as pain, are categorized depending on the meridians they involve, their Yin or Yang character, and whether the flow of “Qi” is excessive or inadequate (Matos et al., 2021).

FS is a disorder caused by “Qi obstruction”, commonly known as the “Bi syndrome”, and is characterized by significant locomotor abnormalities. “Bi,” also known as “Painful Obstruction Syndrome,” causes muscle, tendon, and joint pain, soreness, or numbness. It refers to discomfort, soreness, or numbness produced by an obstruction in the circulation of “Qi” and Blood in the meridians caused by an invasion of Wind, Cold or Dampness, which are referred to as external pathogenic factors in TCM. It is said to be caused by a lack of Yin and weak epidermal defence against pathogenic factors like Wind, Cold, and Dampness entering the body. (Rebecca, 2017).

By employing acupoints K6 (Zhaohai), K3 (Taixi), Ren12 (Zhongwang), St36 (Zusanli), Ren6 (Qihai), Liv3 (Taichong), Li4 (Hegu), Gb34 (Yanglinquan), taner point, combination point of St38 (Tiaokou), Gb41 (Foot-linqi), and Ah-shi points to treat the manifestation and the root causes; spleen yang deficiency, kidney yin deficiency and liver qi stagnation, we were able to successfully treat this patient.

Conclusion

Acupuncture treatment can successfully treat frozen shoulder.

Conflicts of interest
The authors declared that there is no conflict of interest.

Author Contributions
C. Indrapala took the lead in management of the patient. R.K.K.D. Ranasinghe, I.H.N. Hemasinghe, H.M.V.A Samaranada assisted the patient management and wrote the manuscript.

Consent
The patient’s information needed for this case report publication was collected anonymously, and the patient’s signed informed consent was obtained.

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