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Minds in Medicine”*

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Preface

Proceedings in Medical and Health Sciences compiles peer-reviewed publications that feature original research, reviews, and scholarly work in areas of medical and health sciences. It is a multidisciplinary platform for the dissemination of knowledge that encourages the integration of clinical practice, biomedical research, and health education.

This academic publication aims to promote intellectual interest, critical thinking, and scholarly collaboration between students, researchers, lecturers, and healthcare workers. This proceeding acts as a platform to help diverse range of researchers in publishing work that represents present challenges, new trends, and innovative solutions within healthcare.

With a focus on quality, relevance, and academic integrity, Proceedings in Medical and Health Sciences aims to make a significant contribution to medical knowledge development and to enable evidence-based practices to improve health outcomes globally.

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Message from Editor-in-Chief and Vice Chancellor

Professor Dr Jayakumar Gurusamy



Welcome to the latest edition of the Proceedings in Medical and Health Sciences, where we continue our mission of inspiring inquisitive minds in medicine. As the Editor-in-Chief, I am thrilled to present a collection of insightful research and thought-provoking perspectives that push the boundaries of medical science and practice.

In this issue, we strive to highlight the importance of interdisciplinary collaboration and stimulate the minds of our students to enquire. Our contributors, who are students and faculty members in their respective fields, share their expertise and passion for improving health outcomes and advancing medical knowledge.

One of the key themes we focus on is the power of curiosity and inquiry in driving medical progress. It is through asking questions, challenging assumptions, and seeking new solutions that we can make significant strides in understanding and treating diseases. We celebrate the inquisitive minds that dare to explore the unknown.

We also emphasize the importance of mentorship and education in nurturing the next generation of healthcare professionals. By fostering a culture of learning and curiosity, we can inspire young minds to pursue careers in medicine and contribute to the ever-evolving landscape of healthcare.

As you read through this issue, I encourage you to embrace the spirit of inquiry and let your curiosity guide you. Whether you are a seasoned professional or a budding medical student, there is always something new to learn and discover. Together, we can continue to inspire inquisitive minds and drive the future of medicine.

Finally, I would like to place on record our appreciation and thanks to all the faculty members and to the editorial board for supporting, mentoring the students and assisting in putting together these proceedings.

To our students, we are delighted and thankful to have the young inquisitive minds who are going to be the healers and researchers in the years to come. Thank you for your continued support and dedication to our proceedings. We look forward to your feedback and contributions as we strive to make a meaningful impact on the world of healthcare.

Message from Pro Vice Chancellor

Professor Dr Adinegara Lutfi Abas



It is with great pride and pleasure that I extend my heartfelt congratulations to all the students and faculty members who contributed to the Mentored Student Projects Conference, compiled here in the *Proceedings in Medical and Health Sciences*. This compilation not only captures the scholarly endeavours of our young medical researchers but also marks an important step forward in embedding a strong research culture within our undergraduate medical program.

The theme “*Inspiring Inquisitive Minds in Medicine*,” resonates deeply with our institutional vision, which is to nurture future physicians who are not only competent clinicians but also critical thinkers, ethical researchers, and lifelong learners. The diversity of topics, methodological rigour, and depth of analysis presented in this proceeding reflect the maturity of our students' understanding and their readiness to contribute meaningfully to the scientific community.

I would also like to take this opportunity to acknowledge the tireless efforts of the organizing committee, academic supervisors, reviewers, and the Research Management Centre (RMC) for their support in making this effort a success. The integration of structured research training at the undergraduate level—through initiatives like the Mentored Student Projects—not only enriches our curriculum but also equips our students with skills essential for evidence-based medical practice and postgraduate research.

To our students: your curiosity, perseverance, and innovative spirit are the driving forces behind this achievement. I encourage you to continue asking questions, challenging norms, and pushing the boundaries of medical knowledge. Today's mentored project may very well be the foundation of tomorrow's breakthrough in healthcare.

I hope this proceeding serves as both a milestone and a motivation for all current and future batches to pursue research with the same passion and integrity. Together, let us continue fostering a culture of inquiry, collaboration, and impact in medical and health sciences.

Table of Contents

	EXTENDED ABSTRACT	PAGE NUMBER
1.	SLEEP AND ITS IMPACT ON STUDENT'S ACADEMIC PERFORMANCE: A MIXED-METHODS STUDY	1
2.	SLEEP QUALITY AND ITS RELATIONSHIP WITH HAPPINESS AMONG MEDICAL STUDENTS: A MINI REVIEW	4
3.	COMPARATIVE STUDY OF THE ANTIOXIDANT AND ANTICHOLINESTERASE INHIBITORY ACTIVITIES OF <i>MORINGA OLEIFERA</i> LEAVES HARVESTED AT DIFFERENT GROWTH STAGES	7
4.	A QUESTIONNAIRE-BASED STUDY TO ASSESS KNOWLEDGE AND ATTITUDE ABOUT THALASSEMIA AMONG UNDERGRADUATE MEDICAL STUDENTS IN A PRIVATE MEDICAL UNIVERSITY COLLEGE IN MALAYSIA	10
5.	LEARNING STYLES FOR EFFECTIVE LEARNING AMONG UNDERGRADUATE STUDENTS IN A PRIVATE MEDICAL UNIVERSITY COLLEGE IN MALAYSIA	13
6.	KNOWLEDGE, ATTITUDE AND PERCEPTION ABOUT SIGN LANGUAGE AND THE DEAF – MEDICAL STUDENTS' PERSPECTIVE	17
7.	DISCRIMINATION BETWEEN FACIAL CREAMS OF DIFFERENT BRANDS USING STATISTICAL AND CHEMOMETRIC TECHNIQUES	20
8.	SELF-PERCEPTION, CONCERNS AND DEMANDS REGARDING TEETH WHITENING AMONG PRECLINICAL MEDICAL STUDENTS IN MUCM	23
9.	THE EFFECT OF MEDICINAL PLANTS ON ENDOTHELIAL FUNCTION AND ATHEROSCLEROSIS: A MINI REVIEW	26
10.	ANTIDIABETIC AND ANTIOXIDANT ACTIVITY OF GINGER (<i>ZINGIBER OFFICINALE</i>) EXTRACTS: A MINI REVIEW	30
11.	KNOWLEDGE, ATTITUDES AND PRACTICE OF A PRIVATE UNIVERSITY STUDENTS TOWARDS THE CONSUMPTION AND HEALTH BENEFITS OF FERMENTED FOODS	34
12.	STUDY ON THE LEVEL OF AWARENESS OF HEALTH ISSUES INVOLVED IN CYBERADDICTION AND WILLINGNESS TO CHANGE AMONG MEDICAL STUDENTS	37
13.	NANOMEDICINE – A VERSATILE TOOL IN MANAGING DIABETIC WOUNDS: A MINI REVIEW	40
14.	VIRTUAL SCREENING OF PHYTOCONSTITUENTS OF <i>TINOSPORA CORDIFOLIA</i> FOR THEIR ROLE AGAINST TNF α IN INFLAMMATION: AN <i>IN SILICO</i> STUDY	43
15.	NANOMEDICINE IN THE MANAGEMENT OF DIABETIC NEPHROPATHY: A MINI REVIEW	46
16.	PREVALENCE OF FLAT FOOT ANOMALIES AMONG UNDERGRADUATE STUDENTS FROM DIFFERENT ETHNIC POPULATIONS	49

SLEEP AND ITS IMPACT ON STUDENT'S ACADEMIC PERFORMANCE: A MIXED-METHODS STUDY

EXTENDED ABSTRACT 01

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Keywords: sleep, sleep quality, sleep quantity, academic performance

Introduction

A healthy lifestyle is dependent on getting enough sleep. Sleep, which is not only calming but also important for improving memory and work efficiency, initiates the restorative process. Furthermore, getting too little sleep may be harmful to one's health. Without enough sleep, the brain cannot function properly, which can lead to difficulties with concentration, memory processing, and decision-making. A variety of physiological factors like the light-dark cycle, personal activities, and academic schedules influence the circadian rhythm in young adults [1].

Due to their demanding academic obligations and personal habits (like using a phone or consuming caffeine), university students occasionally have irregular sleeping patterns [2]. Sleep habits, especially wake-up time, account for the difference in grade point averages (GPA), with late wake-up time being connected with poor grades [3]. According to a recent study, inadequate sleep has a negative impact on medical students' grade point averages [4]. Studies have shown that adequate sleep duration is necessary for developmental tasks to be completed and that it also affects academic performance (short-term sleep, sleeping late, or rising early are examples of insufficient sleep duration) [5]. Student behaviour and emotional stability are negatively impacted by sleep deprivation, which can result in drowsiness, stress, and difficulty catching up in class [6]. Insufficient

sleep contributes to health issues (such as fatigue, headaches, hypertension, and depression), which have raised absenteeism and have had a negative effect on students' academic performance [7]. Thus, it is important to assess the effects of sleep on students. The effects of work schedule, sleep quality, and sleep duration on student academic performance were examined in this mixed-methods study. The objectives of this study are to estimate the quality of sleep among undergraduate medical students in a Malaysian medical college, to estimate the quantity of sleep among these students, to develop a questionnaire for assessing the effects of sleep on academic performance, and to examine the factors that facilitate or hinder sleep in relation to academic performance.

Methods

A framework was first developed as to the appropriate questions which would be asked during the focus group discussions (FGDs). Questions were derived from this framework and were validated by six external validators. Six FGDs were conducted. The sample size for the qualitative study was decided by the data saturation method. Reflexive thematic analysis was used to analyse the qualitative data where the data was analysed through six phases. First, data was repetitively read from the transcripts of the FGDs. The transcripts were then coded, and themes were created. The themes were examined

again rechecked and reworded. Lastly, we inferred and obtained the themes.

Based on the qualitative study analysis, questions were derived for the quantitative study. Content validity of the questions was done by six experts. Based on content validation, we obtained a Likert-scale questionnaire consisting of 18 questions and 3 close-ended questions. The sample size calculated for the quantitative study was based on the formula $N = p(1-p) (Z\alpha/E)$, where $Z\alpha$ = constant set by convention according to accepted α error (0.05); P = proportion of population from previously published research data⁴; E = Desired margin of error $N = p(1-p) \times (Z\alpha/E) = 0.6424(1-0.6424) \times (1.96/0.06) = 245.03$. The total sample size calculated was $N = 245$ subjects at a 95% confidence level. The participant drop-out rate was considered as 10%. The convenience sampling technique was used for both the qualitative and quantitative (survey) part of the study. Ethics clearance was obtained from the Research Ethics Committee, MUCM (Reference number: MUCM/REC – 067/2022). Pearson’s chi-squared test was used to analyse the quantitative data.

Results and Discussion

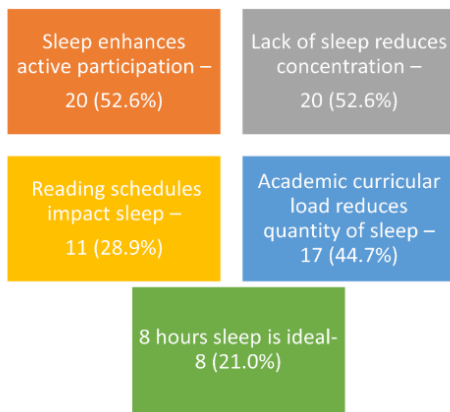


Figure 1. Themes obtained from six focus group discussions

A total of 38 subjects (15 males, 23 females) were included for the qualitative study. Five themes were obtained from the FGDs as shown in Figure 1. Eleven (28.9%) of the 38 students mentioned that they study till late night. Seventeen (44.7%) students mentioned that academic circular load reduced their quantity of sleep, whereas twenty (52.63%) students said that lack of sleep reduced their concentration while studying.

The quantitative study included a total of $n=257$ (126 males, 131 females) subjects. The Cronbach’s Alpha for the questionnaire was 0.767. Twenty-five (9.7%), 76 (29.6%), 102 (39.7%), 26

(10.1%) and 13 (5.1%) respondents mentioned they had 4 hours, 5 hours, 6 hours, 7 hours, and 8 hours of average sleep per night, respectively (Pearson’s Chi-squared test= 433.3, $p < 0.001$). Fifty-eight (22.5%) of the students with less amount of sleep were having poor perceptions about their academic performance. Thirteen (5.1%), 21 (8.2%), 70 (27.2%), 84 (32.7%), and 69 (26.8%) responded that academic stress affects the quality of sleep never, rarely, sometimes, often and always, respectively (Pearson’s chi-squared test= 80.1, $p < 0.001$). Four (1.6%), 29 (11.3%), 66 (25.7%), 98 (38.1%), and 60 (23.3%) responded they never, rarely, sometimes, often, and always, respectively engaged in late-night study sessions (Pearson’s chi-squared test = 101.3, $p < 0.001$). Eleven (4.3%), 47 (18.3%), 133 (51.8%), 53 (20.6%), and 13 (5.1%) responded that they never, rarely, sometimes, often, and always, respectively about being well-rested and able to perform at their best (Pearson’s chi-squared test= 190.4, $p < 0.001$). Sixty-six (25.6%) of those well-rested had a good perception of academic performance. Eighteen (7.0%), 33 (12.8%), 111 (43.2%), 69 (26.8%), and 26 (10.1%) replied that they never, rarely, sometimes, often, and always, respectively about how sleep hygiene affects their ability to be productivity and stay fresh throughout the day (Pearson’s chi-squared test = 115.9, $p < 0.001$). Ninety-five students (36.9%) with poor sleep hygiene had poor perceptions of academic performance.

Studies show that sleep is affected by academic workload and vice-versa. Our cohort of medical students (22.5%) perceive that lack of sleep affects academic performance. Studies from around the world have shown that increased academic stress levels in medical students result in sleep deprivation, which affects their sleep quality and quantity [8-14]. Our study results are comparable to other studies which compared sleep and academic performance among medical students [15,16]. The study has limitations, the actual academic performance of the cohort was not included, and a self-reported questionnaire was utilized. Purposive sampling may have yielded specific results comparing student academic scores and sleep. According to a study by Almojali et al, students should be given academic counselling to help them develop suitable sleep hygiene habits and stress-reduction techniques through academic counselling [17]. Our study results show that students are aware of sleep hygiene and its requirement for better health and academic performance, However, they also feel that staying up late hours is important to meet the academic demands and score well in their examinations.

Conclusion

Medical students have concerns about sleep quality and quantity. Their sleep quality and quantity are influenced by academic workload and the pressure to maintain good academic performance.

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SLEEP QUALITY AND ITS RELATIONSHIP WITH HAPPINESS AMONG MEDICAL STUDENTS: A MINI REVIEW

EXTENDED ABSTRACT 02

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Keywords: sleep quality, happiness, medical students, daytime dysfunction, well-being

Introduction

Sleep is an important determinant of health and well-being that directly influences mood, attention, memory consolidation, and immune function [1]. In the life of medical students, adequate sleep is required due to the psychological demands of studying. The rigorous academic schedule, long hours of study, and clinical practice place students under high stress, so sleep is essential. However, there is a high prevalence of sleep disorders among medical students globally, with preclinical students being the most vulnerable since they enter challenging academic environments [2]. In addition to academic pressure, students are confronted with the difficulty of adapting to new environments, coping with social interactions, and meeting high expectations, all of which have a tendency to disrupt sleep patterns and erode mental health [3].

Happiness, as well as feeling well and satisfied, has been increasingly recognized as a public health goal. It has been proven that good sleep contributes significantly to subjective happiness in the form of greater emotional stability and reduced stress and fatigue [4]. Among preclinical medical students, a balance between fulfilling the demands of their studies and their own well-being is an enormous challenge considering that the psychological load of medical training has been shown to influence emotional well-being. This mini-review elaborates on how various elements of sleep quality contribute to the level of happiness among preclinical medical students and highlights key findings from current research. Through the relationship between sleep disturbance and

happiness, this paper also aims to provide insights into how the enhancement of sleep quality can be an important factor in enhancing the overall well-being of medical students.

Sleep Quality in Preclinical Medical Students

Poor sleep quality is highly prevalent among preclinical medical students worldwide, with a significant number of students reporting inadequate sleep. According to Azad et al., sleep disturbances affect up to 70% of medical students, with common issues including prolonged sleep latency, nighttime awakenings, and daytime fatigue [5]. The Pittsburgh Sleep Quality Index (PSQI) is among the most prevalent tools to assess sleep quality. It measures various subdomains such as subjective perception of sleep, duration, onset latency, efficiency, disturbances, medication use, and daytime dysfunction. These measurements provide an overall impression of the quality of sleep so that researchers would have a clearer picture of the sleeping problem itself that medical students face.

Research consistently shows that students score their sleep as "fairly bad" or "very bad," with a significant percentage reporting that they sleep fewer than 6 hours per night. A study shows that a high prevalence of medical students experience sleep deprivation, with this being further increased by late-night studying and stress to meet academic standards [6]. Sleep latency, the duration to fall asleep, is longer in this population because of stress, consumption of coffee, and use of electronic devices before bedtime [7]. Sleep disturbances such as frequent wake-ups, nightmares, and restlessness

because of noisy environments are also prevalent and are the cause of poor sleep quality globally.

Despite a very high percentage of students not taking sleep medication, there remain many students who score low habitual sleep efficiency, indicative of a failure to maintain unbroken sleep. Daytime dysfunction is also common. Students report feeling tired and having difficulty staying awake and alert during the day, which directly impacts their academic functioning and ability to learn. This inability to function effectively during the day is not only a sign of bad sleep quality but also a reason for higher levels of unhappiness and stress and anxiety.

Happiness and Its Determinants in Medical Students

Happiness in medical students is influenced by various personal, social, and environmental variables. Family support, interpersonal relationships, economic security, and academic satisfaction are some of the important determinants in deciding the net happiness levels [8]. The Oxford Happiness Questionnaire (OHQ) has been widely used to determine the level of happiness among university students, including medical students. Conclusion from various studies has shown that most medical students report a moderate or sub-average happiness score for themselves, and have higher rates of emotional distress than other groups of students [9].

In another study, it was found that happiness was determined both by external and internal factors like sleep quality, emotional resilience, and perceived stress [10]. This suggests that happiness may not be caused by external circumstances but also based on the ability of a person to manage internal stressors and emotions. For medical students, the extremely stressful conditions in the preclinical years, with extensive study periods, continuous exams, and limited social interaction, contribute significantly to reducing life satisfaction and overall happiness. The psychological pressure of medical education can lead to burnout, anxiety, and depression, all of which decrease subjective happiness [11].

The Link Between Sleep Quality and Happiness

A recent study has revealed a high correlation between happiness and sleep quality among medical students. Factors such as subjective sleep quality, sleep duration, and daytime dysfunction have emerged as robust predictors of happiness. Hershner and Chervin discovered that the students who had higher sleep satisfaction were likely to rate higher on life satisfaction and happiness

regardless of the external pressures they faced [12]. On the other hand, low quality of sleep has been linked to irritability, mood disorders, depressive mood, and lower satisfaction with life.

Daytime dysfunction, or the inactivity of being alert and awake in the daytime, is one important factor in contributing to the spiral downward in happiness. Irregular sleep and lack of sleep aggravate daytime drowsiness, which then converts into poor performance at school, loss of interest in daily activities, and discontent. This compound effect can create a vicious circle of unhappiness, with disturbed sleep causing emotional distress, and in turn increased sleep disturbances [13]. Further, multiple regression analyses in the studies have revealed that poor subjective quality of sleep and increased daytime dysfunction were major predictors of reduced happiness scores. Other sleep measures, such as sleep duration and sleep disruption frequency, also influence happiness, although their influence will probably be less than for subjective sleep quality and daytime functioning.

Significantly, sleep medication use appears not to bear any strong association with happiness, suggesting that addressing the root causes of disrupted sleep such as stress management, proper time management, and improvement in sleep hygiene have been proven to be a better option compared to pharmacologic treatment. This underlines the importance of preventive actions as well as behaviour-driven interventions towards better sleep quality and, in fact, happiness (Figure 1).

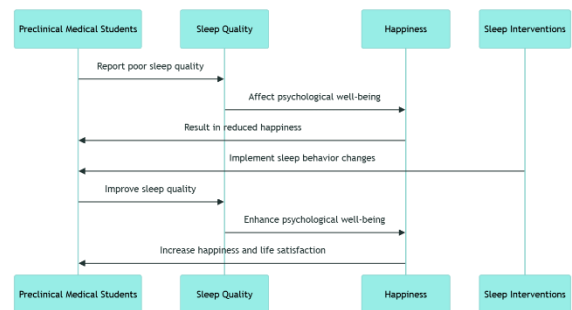


Figure 1: The link between sleep quality and happiness.

Implications for Medical Education and Student Well-Being

The consistent correlation between sleep quality and reduced happiness makes it imperative for targeted intervention during medical education. Medical schools are bound to focus on the welfare of their students because mental and emotional conditions influence the students' performances and then their careers directly [14]. There are several interventions

for improving sleep quality and enhancing happiness among medical students.

It is important to integrate wellness programs into the medical curriculum. They can include time management workshops, stress management training, and sleep hygiene education regarding the importance of sleep. Furthermore, offering mental health counselling services and promoting mindfulness and relaxation exercises will help students cope with the stressors of medical education. Encouraging students to engage in self-care, sleep well, and exercise are also ways that can maximize sleeping outcomes and mental well-being.

In addition, creating an educational environment that is warm and encourages community and fewer conflicts can assist in removing some of the tension that damages sleep. Peer mentoring, flexible scheduling of classes, and social engagement opportunities can be utilized to buffer the pressures that create sleep issues and low happiness levels. Social and family support also play crucial roles in defense against stress, and institutions can encourage students to have a strong support system so that they may develop stronger emotional resilience [15].

Conclusion

Sleep quality is an important but generally neglected aspect of medical student health. This mini review highlights the global prevalence of poor sleep among preclinical medical students and its strong association with reduced happiness. Subjective sleep quality and daytime dysfunction emerge as important determinants of psychological well-being. Because sleep and happiness are so closely connected, interventions in student sleep behavior can have long-term effects on learning, emotional health, and satisfaction with life. Both individual- and institution-level interventions are needed in order to create a healthier, more balanced, and more satisfying student experience. Improving sleep quality not only benefits happiness but also improves cognitive functioning, which is critical to success in medical school and subsequently in clinical practice.

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COMPARATIVE STUDY OF THE ANTIOXIDANT AND ANTICHOLINESTERASE INHIBITORY ACTIVITIES OF *MORINGA OLEIFERA* LEAVES HARVESTED AT DIFFERENT GROWTH STAGES

EXTENDED ABSTRACT 03

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Keywords: Alzheimer's disease, *Moringa oleifera*, neuroprotective, antioxidant, anticholinesterase

Introduction

Alzheimer's disease (AD), a neurodegenerative disorder, affects about 10 million people every year. It is known for its significant impairment of sufferers' cognition and behaviour, changing the lives of both the sufferers and their families. The neuropathological hallmark of AD includes the abnormal accumulation of misfolded protein [1], which interferes with the normal synthesis and release of acetylcholinesterase (AChE). One of the main approaches to AD treatment has been to increase the level of acetylcholine (ACh) in central synapses by inhibiting acetylcholinesterase via the use of AChE inhibitors (AChEIs). The USFDA has approved many AChE inhibitors for the treatment of mild-to-moderate AD patients, including galantamine, donepezil and rivastigmine however these commercially available drugs have several side effects, including gastrointestinal disorders, exhaustion, sleeplessness, and depression [2]. On the other hand, natural plants have been reported to have various biological properties that produce similar mechanisms of action as drugs for AD with fewer side effects. Hence, natural AChEI has gained attention to be used as an alternative treatment for AD. Herb is a plant with soft and succulent tissues that are used for food, flavouring, perfume, and medicine. The World Health Organization (WHO) has confirmed that herbal medicines serve the health

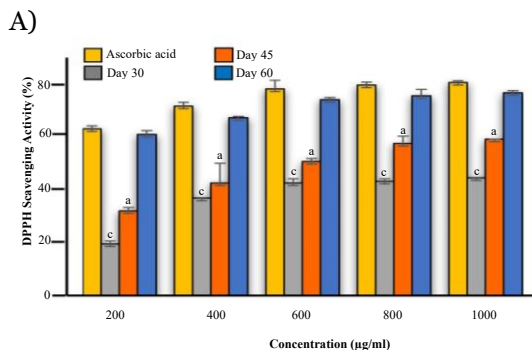
needs of approximately 80 per cent of the world's population, especially providing health care to millions of people in rural areas of developing countries [3]. Some herbal medicines may be more affordable and accessible than conventional medicine. For example, *Moringa oleifera* is a functional and medicinal plant, where various parts of it can be used. This small-medium-sized tree also known as a 'miracle tree', has been reported to have several health benefits, treat severe ailments and boost the immune system. These are achieved by their various pharmacological properties, including antioxidant, anti-inflammatory, immunomodulatory, hypoglycaemic, hypolipidemic, anticancer, hepato- and kidney protective properties [4]. The leaf part of *Moringa Oleifera* has various pharmacological activities correlating to its compositions and contents [4-7]. *Moringa oleifera* leaves (MOL) exhibit a neuroprotective effect, where it plays a vital role as an antioxidant and anticholinesterase [8-9]. However, the different growth stages of MOL that possess different potent bioactivities remain unclear. This study aimed to compare the antioxidant and anticholinesterase inhibitory activities of MOL harvested at 30, 45 and 60 days using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and acetylcholinesterase assays respectively.

Methods

Moringa oleifera were planted at Kompleks Dar AI Hikmah, Terengganu, and leaves were harvested on days 30, 45, and 60. The antioxidant activity of MOL was assessed using DPPH assay while the inhibition of acetylcholinesterase activity of MOL was assessed using acetylcholinesterase assay. For the DPPH assay, MOL extracts were used. MOL was extracted in ethanol at a solid-to-liquid ratio of 1:10. Next, DPPH solutions were added to the MOL extracts followed by incubation in the dark at room temperature for 30 minutes. The absorbance was determined at 515 nm where ascorbic acid was used as a positive control. For the acetylcholinesterase assay, MOL lysates were used. The lysates were prepared by homogenization in a lysis buffer. Next, acetylthiocholine-reaction mixtures were added to MOL lysates followed by incubation in the dark at room temperature for 30 minutes. The absorbance was determined at 410 nm where donepezil was used as positive control. The experiments were carried out in triplicate and data was analyzed with ANOVA followed by Tukey's post-hoc test using SPSS software (version 28).

Results

From the DPPH assay, we found MOL harvested at day 60 exhibited the highest antioxidant activity compared to day 45 (p-value < 0.05) and day 30 (p-value < 0.001) (Figure 1A). The concentration of MOL required to scavenge 50% of the initial DPPH radicals (IC₅₀ values) harvested at days 30, 45, and 60 were 611.4 µg/ml, 535.2 µg/ml, and 256.6 µg/ml respectively. In contrast, based on the acetylcholinesterase assay, the inhibition of acetylcholinesterase activity was found to be the highest in MOL harvested at day 30, followed by MOL at day 45 and day 60 (p < 0.001) (Figure 1B).



B)

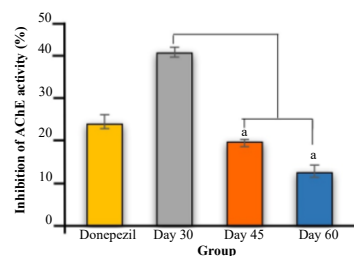


Figure 1. (A) Antioxidant activity of MOL harvested at different growth stages. Data are shown as mean SD, a: p < 0.05, b: p < 0.01, c: p < 0.001 compared to Day 60. (B) Inhibition of acetylcholinesterase activity of MOL harvested at different growth stages. Data are shown as mean SD (n=3). a: p < 0.001 compared to Day 30.

Discussion

MOL consist about 35 important components such as isolated n-hexadecanoic acid, tetradecanoic acid, cis-vaccenic acid, octadecanoic acid, palmitoyl chloride, beta-l- rhamnofuranoside, 5-O-acetyl-thio-octyl, gamma-sitosterol, and pregna-7-diene-3-ol-20-one and so on. Among them, the most important phytochemical constituents that play a major role in antioxidant and anti-cholinesterase inhibitory activity will be tannin, saponin, carotenoids, alkaloids, glycosylates, E-lutein, flavonoids and phenols. The bioactivities in MOL are contributed by its various phytochemical constituents. For example, flavonoids and phenolic acids exhibit antioxidant activity meanwhile E- lutein and α-Linolenic acid possess higher anticholinesterase inhibitory activity [10]. We hypothesized MOL harvested at different growth stages may possess different phytochemical constituents. In this study, we found MOL harvested at day 60 showed the highest antioxidant activity meanwhile MOL harvested at day 30 possessed the highest inhibition of acetylcholinesterase activity. Previous studies have reported antioxidant activity in MOL and it has also shown high content of polyphenols and flavonoids. Interestingly, Nwidi et al. demonstrated the percentage of acetylcholinesterase inhibition activity is inversely correlated to total phenolic and total flavonoid contents. There was no correlation between antioxidant activity and anticholinesterase inhibition activity reported [11].

Conclusion

Our data indicate that MOL harvested at different growth stages possess different bioactivities. The findings of our study can become a reference for future researchers when doing further research in related fields. Depending on the requirement of the studies, MOL at different growth stages should be used in accordance with the highest level of phytochemicals presented at each stage to give the most effective result. However, more studies in the identification of different phytochemical constituents at different growth stages of MOL are required to correlate their bioactivities and to suggest their chemical markers in relation to Alzheimer's disease. These include studies like total phenolic content and total flavonoid content assays. More advanced studies using metabolomic approaches such as liquid chromatography-mass spectrometry (LCMS) and high-performance liquid chromatography (HPLC), can also be done for the identification of phytochemical constituents. When the specific phytochemicals and their respective bioactivities in MOL are identified, then a more specific and focused approach can be formulated to aim for a breakthrough in the treatment of Alzheimer's disease.

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A QUESTIONNAIRE-BASED STUDY TO ASSESS KNOWLEDGE AND ATTITUDE ABOUT THALASSEMIA AMONG UNDERGRADUATE MEDICAL STUDENTS IN A PRIVATE MEDICAL UNIVERSITY COLLEGE IN MALAYSIA

EXTENDED ABSTRACT 04

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Keywords: thalassemia, genetics, knowledge, attitude, awareness

Introduction

Thalassemia remains the most common single-gene disorder affecting the Malaysian population [1]. It results due to reduced production or absence of alpha and beta-globulin chains of haemoglobin. Patients with thalassemia are required to undergo frequent red blood cell transfusions and iron chelation therapy to avoid iron overload and iron toxicity [2]. Thalassemia is widespread in Mediterranean countries, Central Asia, Southern China, India as well as a few countries in Africa and South America. Among the countries mentioned, Southeast Asia displayed the highest carrier frequency of a combination of beta-thalassemia with abnormal haemoglobin exhibiting thalassaemic properties with the prevalence of 50% [3]. In 2018, Malaysia Thalassemia Registry (MTR) has documented that there are a total of 8681 patients with thalassemia in which 7984 are reported alive and remaining 697 patients have deceased [2]. Despite the high prevalence of this disorder in Malaysia, there are only a handful of studies done to assess the awareness of thalassemia among the Malaysian population. Hence, this study is important to determine the level of awareness of thalassemia among medical undergraduates in a private University College in Malaysia which would benefit them as medical professionals in the future. The primary aim was to assess the knowledge, attitude, and awareness about thalassemia among medical students. Moreover, we aimed to assess the proportion of students who are aware of thalassemia

carrier status of themselves and their relatives. Secondly, we sought to compare knowledge and attitude of thalassemia among students in a private medical university college in Malaysia.

Methods

A non-probability sampling method, convenient sampling was used to recruit the students from our university. A population size of 1350, 54.70% of adequate knowledge among medical students based on previous studies, precision era of 7%, 95% confidence level [4]. The minimum sample size require was 170. We allowed 20% non-response. Therefore, we recruited a total of 213 undergraduates in this study. The questionnaire was made and distributed through Google Forms. The questionnaire was divided into 4 sections, Section 1 was the consent form to make sure the students understand their rights and to obtain their consents to participate in this research. Section 2 consisted of questions to obtain the general information from the students such as their gender and the course they are taking. Section 3 of the questionnaire was designed to measure the knowledge of students. It consisted of 10 questions, for each correct response, 1 mark was awarded and for each incorrect response, 0 mark was awarded. Lastly, section 4 assessed the attitude of students, this section also consisted of 10 questions. 2 marks were given for each positive response, 1 mark was given for each neutral response, and 0 mark was awarded for each negative response. In addition, we obtained an ethical approval number of

MUCM/REC – 072/2022 from the ethical committee before the distribution of the questionnaire. The data obtained was analysed and organised using Statistical Package for the Social Sciences (SPSS) version 29.0 by IBM to visualise the outcome.

Results

Data was collected from 210 students, of which 134 were female and 76 were male. 60% of the respondents stated that they were aware of their thalassemia carrier status, and the remaining 40% were not aware. 28.6% of the respondents knew someone who is a carrier of thalassemia or someone who is suffering from thalassemia and the remaining 71.4% did not know anyone who is a thalassemia carrier or patient. The mean score collected from the knowledge section was 54.2 (2.138) %. The median of this section obtained was 5, and the maximum score obtained from this section was 10 whereas the minimum score was 0. In the attitude section however, a mean score of 86 (2.845) %. The median for this section was 18, and the highest score achieved was 20 while the lowest score achieved was 6. T-test was done on a several different variables but only one showed a significance with a p value less than 0.05. There was an association found between the gender and the knowledge score of the students. The male students obtained a mean score of 5.84 and the female students scored a mean of 5.18, leading to a mean difference of 0.66. (P value = 0.0305) (Table 1).

Table 1: T-test results of different variable

T-Test Result	
Mean Score among Male Students	5.84
Mean Score among Female Students	5.18
Mean Differences	0.66
P Value	0.03045

Discussion

The result suggested that the majority of the students showed a positive attitude towards thalassemia. However, they only had a moderate knowledge of thalassemia. Furthermore, only 60% of the students were aware of their thalassemia carrier status despite having adequate facilities available in public health care setup, there are still a handful of students who are yet to obtain their thalassemia carrier status. The result also stated that only 28.6% of the students are related to a thalassemia carrier. Our research also

demonstrated that the male respondents displayed better mean knowledge compared to female respondents with a mean score difference of 0.66. Numerous studies similar to this have been conducted all around the world and they have shown various results. A particular cross-sectional descriptive research study was conducted in Iran in 2014 with a sample size of 700 plus students to assess the knowledge level about thalassemia. The results concluded that more than half of the students had an average amount of knowledge on Thalassemia [5]. Similarly, in research performed in Kalimantan, Indonesia in 2020 with a similar method but smaller sample deduced that many high school students have poor understanding of thalassemia. Although the study was tabulated based on different aspects, it was also seen that female respondents have a better comprehension in comparison to male respondents [6].

Conclusion

The study demonstrated an overall positive attitude towards thalassemia screening, awareness, and diagnosis. The study also indicated that there is a scope of improving the knowledge on thalassemia among undergraduate students as thalassemia is the most common single gene genetic disorder in Malaysia. Study recommends incorporation of thalassemia in depth into medical curriculum to raise awareness and improve knowledge. Campaigns and events such as an awareness runs, or workshops can be carried out more often to raise awareness on thalassemia screening test as there were still a handful of students who were yet to obtain their thalassemia carrier status through screening.

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LEARNING STYLES FOR EFFECTIVE LEARNING AMONG UNDERGRADUATE STUDENTS IN A PRIVATE MEDICAL UNIVERSITY COLLEGE IN MALAYSIA

EXTENDED ABSTRACT 05

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Keywords: Learning styles, lifelong learning, VARK questionnaire, undergraduate students, ethnicities

Introduction

Learning is a permanent change in behaviour and experiential learning, one of the adult learning theories happens when knowledge is created through the transformation of experience and incorporating it in regular day-to-day practice [1-3]. Facilitating this learning process is the primary aim of teaching i.e. understanding the learning behaviour, pattern, style of students, learning environment, and approaches, is an important part of this process. Learning patterns have undergone a paradigm shift, especially with the millennial generation having different learning habits, learning styles, skills, technology savvy students and planning of context-dependent TL methods is imperative. Learning style is thought to be one of the important factors that promotes and leads to success in higher education. There is no single ideal style that is commonly accepted or existing as learners are different in their cognitive and psychomotor skills. Students adopt a mix of strategies; however, one style may be preponderant [4].

Teachers' role has changed over the years from acting as mere educators/facilitators. A conscious change in our thinking is warranted as there has been a paradigm shift in role/s from "sage on the stage to a guide by the side". Teachers need to assimilate that facilitating the learning process is the primary aim of teaching [5] and a thorough understanding of the learning styles and behaviour of students is considered to be an important part of this process [6]. Awareness of the knowledge of

learning styles by faculty members will indeed be helpful to tailor pedagogy and Teaching - Learning activities to coincide with the appropriate learning styles shown by a vast majority of students [7]. Awareness of students' learning styles and their preferences will enable them to use different techniques to promote and enhance learning, which in the long run may impact their overall educational satisfaction and goal. This alignment is very critical and useful when the teaching style of the teacher does not match the learning style of the student. A good connection between the student's learning styles and the teacher's teaching style is mandated and efforts for a right pedagogical contextual learning framework should be provided for students to foster better learning and application. This will play a very important role in helping students to cultivate lifelong learning habits. This study is aimed to orient the students regarding the learning styles employed by students, understand the learning styles of students, and analyze the learning styles of different ethnicities/cultures at Manipal University College Malaysia (MUCM).

Methods

The study is a cross-sectional questionnaire study involving the undergraduate students of MUCM. The sampling method was non-probability sampling (non-random selection with convenient sampling). All students of 2nd year Medical (MBBS) and Dental (BDS) at MUCM (n=225) were included in the study to assess their learning styles of the students.

Students were oriented regarding the learning styles. The study objective, methodology, and study design were clearly explained to all the students. Informed consent was collected from the students along with demographic details which was recorded using an online Google form. A pre-validated questionnaire i.e. visual-aural-read/write-kinesthetic (VARK) questionnaire (Neil Fleming’s VARK model of Student Learning) [8] was used to record the learning styles of the students. Prior to administering the test to the student population, the VARK questionnaire was pilot-tested with a small cohort of students (eight students) to check the reliability and the applicability of the instrument. An informal discussion was conducted to validate the results by correlating the VARK findings with the actual learning styles of the students who participated in the pilot study. After validating the instrument, the VARK questionnaire was administered to the student by an online Google form, with ample time given to respond and responses were collected. Responses were collected and analysed using MS Excel and SPSS (IBM trial version 29.0). Demographic details were collected, and the learning style responses were recorded. The data was represented as percentages of learning style categories as well as percentages of learning styles among different ethnicities. Ethical approval was obtained from the institution’s research ethics committee to conduct this research (Reference Number: MUCM/REC – 068/2022).

Results

Responses from students were tabulated and analysed. 225 students responded to the VARK questionnaire of which 163 (72.8%) were MBBS students and 62 (27.2%) were from the BDS groups. Analyses of the male-female ratio revealed that 162 (72%) were females and 63 (28%) were males. The data was analysed using MS Excel to tabulate the percentages of each group of learning styles. Analyses of the VARK questionnaire showed that 122 (54.20%) students were kinaesthetic learners, 43 (19.20%) were auditory learners followed by 40 (17.80%) who were visual learners, and 17 (7.50%) were read/write learners predominantly. Three (1.30%) students showed equal distribution of all four styles. Kinaesthetic learners predominated in both batches i.e 87 (53.3%) in MBBS groups and 35 (56.5%) in BDS groups (Figure 1). Analyses of the predominant learning styles among various ethnicities among our students (Table 1) showed that Indians were highest at 129 (57.3%) in our cohort and the preponderant style was kinaesthetic (29.3%)

followed by Chinese group 70 (31.1%) with 42 (18.6%) having kinaesthetics learning style.

Table 1: Distribution of learning styles based on ethnicities (in numbers)

Males (n=63) 28%															
Chinese (n=25)				Malay (n=3)			Indians (n=31)				Others (n=4)				
V	A	R	K	V	A	R	K	V	A	R	K	V	A	R	K
3	4	2	16	1	0	0	2	1	9	5	16	2	1	0	1
Females (n=162) 72%															
Chinese (n=45)				Malay (n=9)			Indians (n=98)				Others (n=10)				
V	A	R	K	V	A	R	K	V	A	R	K	V	A	R	K
13	5	1	26	1	2	0	6	18	18	8	51	1	3	1	6

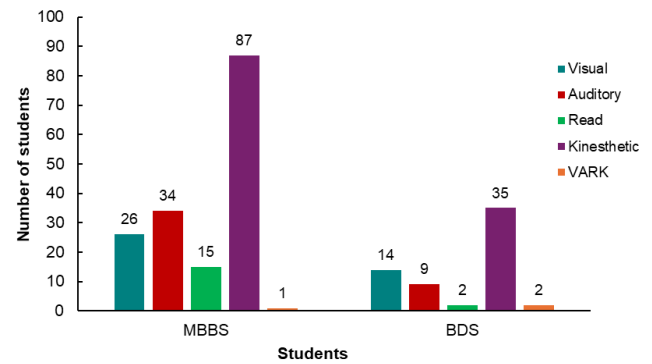


Figure 1: Distribution of learning styles amongst the students’ batches (in numbers).

Discussion

The current study assessed the learning styles of undergraduate medical and dental students. Most of the students are kinaesthetic learners who learn by involving in an activity, while very few are read/write category. Teaching and learning activity is recommended to be activity-based a blend of visual and other styles. Our study findings are similar to the study conducted by Subagja & Rubini (2023) who also reported that the predominant learning styles of students were kinaesthetic 35% [9]. Analysing the learning styles helps to understand the process of perceiving and processing information by undergraduate students. Student learning is multifactorial comprising of students (learner), environmental, and teacher-driven factors. The learner factors such as self-awareness, learning styles, study habits, the influence of learning opportunities, personal attributes, etc. are detrimental. Appropriate learning environment – curriculum, classroom setting, technological

support, conducive environment in classrooms, library, and study places are also directly linked to students' learning.

Learning styles are defined as “specific cognitive, affective, and psycho-social behaviour that serve as relatively stable indicators of the way learners perceive, interact and respond to the learning environment [10]. The most important reason for determining learning style is to create a proper teaching strategy [11-14]. However, there seems to be no exact relationship between students' learning styles and the curriculum of a program described in the literature [15]. Learning style alone is not the only factor that may influence a learning situation. Many other factors, such as the educational and cultural context of the university, individual self-awareness, life experiences, other learning skills, the effect of educators, and motivation level, may influence the learning process [16].

Students join institutions with different ethnic and cultural backgrounds, a variety of training programs, multi-cultural institutions, and differing learning styles [17]. Attempts have been made by authors to propose a possible correlation between culture and learning styles [8, 19]. This is based on the perception that culture influences environmental perceptions which may determine the way in which information is processed, assimilated, and organized by students in order to acquire new knowledge. Culture may be implicated in conditioning and reinforcing learning styles and is the probable reason why teaching methods used in certain parts of the world may be ineffective or less effective when they are blindly transplanted from one learning atmosphere to another [17,18]. Thus, an awareness of faculty members on this phenomenon and its influence on the variety of learning styles present in classrooms is of paramount importance. This is especially true in universities that have large groups of international students from diverse backgrounds, ethnicities, belief systems, and learning patterns. Over the decade, such classrooms have become increasingly common as many schools are expanding their efforts to internationalize [20]. In our study, the Indians were the predominant ethnic group, and there was no attempt to correlate the learning styles with ethnicity and learning, which may be targeted as a future study plan.

Conclusion

The findings of this study suggest that undergraduate students of MBBS and BDS at MUCM were found to be kinaesthetic learners as their preferred learning style. It is a fact that the profession is skill-based, and the results are in line with their preferred learning style. Hence, teaching-learning activities should involve more activity-based based with a mix of visual activities. The Indian cohort was the predominant ethnicity, with the preponderant learning style being Kinaesthetic. Analyses of the learning styles with academic performance may be undertaken in the future to demonstrate if there is any association between them. In addition, we intend to analyze any association between the learning styles with ethnicities and their learning.

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KNOWLEDGE, ATTITUDE AND PERCEPTION ABOUT SIGN LANGUAGE AND THE DEAF – MEDICAL STUDENTS' PERSPECTIVE

EXTENDED ABSTRACT 06

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Keywords: sign language, deaf, medical students, empathy, attitude

Introduction

Medical students who are future doctors would at some point encounter deaf patients and would need to communicate with them [1]. Without knowing sign language (SL), they would require the help of a sign language interpreter to help them communicate. This in return will limit the level of communication, understanding, and building of bond between a doctor and the patient as they would always need a third party to understand each other [2]. Communication is essential to create not only a good but also an effective doctor-patient relationship which would improve the quality of treatment drastically [3]. This study is undertaken among medical students to assess the knowledge, attitude, perception, and empathy of sign language and the deaf by medical students. It is also aimed to know the reasons for learning SL by medical students who were learning or had learnt the language. This study also explored whether knowledge regarding SL and the deaf had an impact on empathy among medical students.

Methods

This research was done among medical students of Manipal University College Malaysia (MUCM) from year 1 to year 5 as a mixed-method study. The data collection included quantitative and qualitative methods. The sample size for the quantitative survey was estimated by using the Epi Info sample size calculator, based on the total medical student population in MUCM (800), estimated frequency of

positive attitudes towards the deaf and SL (25%), with 5% margin of error, and 95% confidence level. The final estimated sample size was 236. The respondents were recruited by convenient sampling method. A validated questionnaire was distributed through a Google form to assess the knowledge, attitude, perception, and empathy of students towards SL and the deaf. The questions were validated by experts in various relevant fields and the item content validity index (I-CVI) was calculated based on their rating. The items with an I-CVI of 0.83 and above were included in the official questionnaire, which was used.

The qualitative data collection was conducted using focus group discussions in 2 groups. The first group included participants who learned/learning SL, and the second group who were not learning SL. Each group comprised nine participants and two facilitators who mediated the discussion by asking a series of open-ended questions. Data analysis for the quantitative data was done through SPSS version 29 with descriptive statistics and an independent T-test. p-values of 0.05 were statistically significant. Qualitative data was analysed by thematic analysis with the generation of codes and subthemes. This research is approved by the institution's research ethics committee (Reference number: MUCM/REC – 074/2022).

Results

A total of 146 responses were received through the Google form that was sent out for the quantitative study. Of these 88 (60%) were from pre-clinical

years (years 1 and 2) while 58(40%) were from clinical years (years 3, 4, and 5). Of the 91% of participants who knew about the SL, 89% of the students were in their pre-clinical years, and 95% were in their clinical years. 22.6% of the medical students were learning or have learnt SL. 64% of these students learning sign language were in preclinical years as compared to 36% in clinical years.

The reasons for learning SL were for improving communication (42%) and empathy (21%) towards the deaf. The other reasons were the need to use SL during practice as future doctors (15%) and on personal interest (15%). The Sign Language Club in the University College too motivated their urge to learn SL. Table 1 shows the comparison of the attitude, perception and empathy between students who learnt and did not learn SL. It was interesting to note that students who were learning SL had a better attitude and perception towards the deaf and empathized on a deeper level with the deaf.

Table 1. Attitude, perception and empathy of medical students who have knowledge and do not have knowledge about sign language and are deaf.

Item	Learning / Not learning SL	N	Mean	SD	p value
Attitude	Not learning	113	30.9735	2.84247	0.008
	Learning	33	32.4242	2.19417	
Perception	Not learning	113	29.5487	3.26231	0.049
	Learning	33	30.7879	2.71290	
Empathy	Not learning	113	32.0088	2.61348	0.009
	Learning	33	33.3939	2.71500	

In the qualitative study, the quotes from the focus group discussion, themes, subthemes, and codes were created to assess the opinions given by the participants. Four main themes were derived, which were attitude, perception, empathy, and knowledge having an impact on empathy.

The theme perception came from the subthemes, limitations of SL and challenging situations. When asked about challenging situations faced by the deaf community, a participant mentioned that, during a fire, a person who is hearing can perceive the sound of a fire alarm. In such situations, the deaf can only see people running around, which makes the experience more stressful for them.

In the attitude theme the subthemes included were positive attitudes towards SL and positive attitudes towards the deaf. These subthemes were classified based on similar quotes that portrayed positive attitudes toward SL and the deaf. Many participants, especially from the SL learning group, mentioned that learning SL was an advantage because as future doctors, they would be able to communicate better with their patients and provide the best treatment possible for them.

The theme of empathy had subthemes such as intentional concern for the deaf and compassion. For compassion, participants were placed in various situations where they had to put themselves in the position of a deaf person and one of them said that they would feel left out growing up as a deaf person especially if their friends were all hearing.

For the theme on knowledge having an impact on empathy, the subthemes were formed based on the ability of participants to understand the root cause of the problem of deaf and prior experiences of participants causing them to have empathy towards the deaf. One participant mentioned that she knows how it feels to speak a language that no one else understands and that experience or prior knowledge made an impact by creating empathy within her to learn sign language to communicate with the deaf.

Discussion

In the present study of the 146 medical students, 89% from the pre-clinical and 95% from the clinical years were aware of SL. This reflects the overall awareness among medical students about the issues of deaf people and the need for possible interventions to mitigate these issues. It was found that 22.6% of the medical students who participated were learning or have learnt SL. This was emphasized in the literature that the knowledge and attitude of medical students were better in those who completed sign language [2].

In the present study, 64% of students learning sign language were in the preclinical years as compared to 36% in the clinical years. However, it was a fact that the students from clinical years had a better understanding of SL and its clinical application [4, 5]. In this study, the higher number of pre-clinical students learning SL could be a reflection of the initiation of the sign language club in the institution.

The reasons for learning SL were to improve communication (42%) and empathy (21%) towards the deaf. The other reasons were its utilization as

future doctors (15%) and for their interest (15%). This would help them in better communication with their patients and their families during their medical practice [1,2]. The Sign Language Club in the University College too motivated their urge to learn SL. It was advised that healthcare personnel need basic skills in SL as communication is important [1,2,4].

Students who were learning SL had a better attitude and perception towards the deaf and empathized on a deeper level with the deaf. This emphasized the need to expose medical students to SL during their training period. This will help them in their practice as doctors as it creates a positive social and emotional state of well-being for patients [2,6].

To summarize, the awareness about issues faced by the deaf and learning SL had a significant impact on the knowledge, attitude, perception and empathy among medical students. This would prepare future doctors to achieve their full potential in providing the best services not only to the deaf but also to every patient.

Conclusion

Ninety-one % of medical students from Manipal University College Malaysia were aware of sign language. 64% of medical students learning sign language were pre-clinical students and their main reason for learning it was to have better communication with the deaf. The knowledge, attitude and perception were significantly higher in students who had learnt or were learning SL. They also showed better empathy. The focus group discussion also emphasized that knowledge about sign language impacted the medical student's ability to empathize with the deaf.

Limitation of the study

The main limitation was the inadequate number of students who participated. The unequal representation of preclinical and clinical students also contributed to the limitations.

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DISCRIMINATION BETWEEN FACIAL CREAMS OF DIFFERENT BRANDS USING STATISTICAL AND CHEMOMETRIC TECHNIQUES

EXTENDED ABSTRACT 07

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Keywords: creams, ATR-FTIR spectrometer, PCA, PPMC, non-destructive

Introduction

Forensic science is an important aspect of serving justice for criminal activities and also absolves an innocent person from suspicion. Finding the origin of cream traces would be an important aspect of the investigations that will help in finding the suspect. The evidence of facial cream traces can help to narrow down the findings of the investigations. Females frequently use cream samples as cosmetic products such as foundation creams, contouring creams, and sunscreen, etc, to enhance their facial features, and this can be easily transferred during the application procedure on different surfaces, including paper, cloth, and other objects [1-3]. This finding makes it relevant to study cream samples and classify them for establishing a connection between the crime and the suspect or victim, which can be offered as useful evidence in court [3-7]. The use of non-destructive evidence with advanced statistics provides a quick source determination of face creams in forensic investigations. Alongside the application of Attenuated Fourier transform infrared spectroscopy (ATR-FTIR), with the statistical techniques of Pearson product-moment correlation coefficient (PPMC) and Principal component analysis (PCA) would provide great significance for source determination of creams in forensic investigation. Medical students could benefit from reading this research to better understand crime scene investigations and their importance in moving a criminal case forward [2].

This study aimed to identify the origin of traces of creams after exposure to different substrates using ATR-FTIR and chemometrics techniques. Moreover, investigating the use of multiple spectroscopic techniques was expected to potentially increase discrimination by permitting a greater amount of information to be extracted from each sample. Furthermore, the use of chemometrics allows more reproducible, reliable, and objective data assessment, thus reducing human subjectivity and enabling more transparent decision-making for forensic investigation. Lastly, this study aimed to investigate the cosmetic product of creams that provide significant value in the forensic area. Using ATR-FTIR and chemometrics approaches intended to pinpoint the source of cream traces that appeared following exposure to various substrates.

Methods

A total of forty-five samples of facial creams from nine brands (viz. Johnson & Johnson, Nivea, Safi, Himalaya, Olay, Cetaphil, Bioaqua, Fair & Lovely, and Vaseline) were collected. Five samples were collected from each brand, totalling up to 45 samples. Six substrates were also collected (viz. paper, cotton cloth, cardboard, mask, cigarette, and tissue paper), and six out of the nine brand samples (Johnson & Johnson, Bioaqua, Fair & Lovely, Safi, Himalaya, and Cetaphil) were applied to the substrates as traces. All 51 samples were submitted to the laboratory where it was analyzed using ATR-FTIR spectroscopy. All data were subjected to

Pearson Product Moment Correlation (PPMC) using Microsoft Excel. Prior to chemometric techniques (PCA), data pre-processing was done using standardization to minimize the variation from instruments. Principal Component Analysis (PCA) was done using Minitab 21.

Results

ATR-FTIR spectroscopy was used to evaluate 45 samples of creams from 9 different brands, extract the data, and determine the chemical makeup based on the spectra pattern. All these data were transferred to Microsoft Excel for PPMC analysis. Since almost all samples had high R², it was hard to identify the cream's true source just on the basis of scatter plot correlation. All PPMC coefficient values for the cream samples were greater than 0.8, showing a high correlation. This is not surprising, due to the chemical similarity of the cream samples. In addition, the unsupervised techniques of PCA plot demonstrate a good separation rate of almost nine clusters, and all six unknown samples (100%) on various traces were fully categorized in accordance with the brands. In this work, we can observe the same pattern of peaks from all cream samples. The peak observed at 2.793578 is for the cream sample Olay, and the peak at 2.399454 can be observed from the Himalaya cream sample. The peak observed in Johnson cream is 2.120523. As for the cream sample from the brand, Fair and Lovely, the peak is observed at 1.668896. The peak observed for the cream sample from the brand Bioaqua can be seen at 1.048659. The peak that was plotted in Cetaphil can be observed at 0.667367.

Discussion

Based on the results obtained, all the samples share the same functional group, and this indicates that they come from the same chemical group (i.e., C—C triple bond, C=C, ketones, with clear evidence of SP hybridized CH.) Therefore, it was identified that the chemical components of the cosmetic creams originate from different brands share the same chemical formulations after being analyzed with an ATR-FTIR spectrometer. To the best of our knowledge, no visualization methods have been specifically devised to capture the structure of large data and we have fully expanded our work here from our previous finding [1-2] using cream samples together with analysis of substrate that is commonly found in the crime scene and demonstrated that these techniques have great potential to be applied in

forensic casework. In a real forensic scenario, the proposed strategy can be used by forensic investigators to determine the identity, in other words, individualize the face creams in this case, face creams deposited on different substrates.

The reason for choosing the ATR-FTIR was due to it being non-destructive, easy to operate, and consuming less analysis cost per sample with little sample preparation. The ATR-FTIR method is a common strategy in forensic real-life scenarios to assist forensic investigation in identifying the identity component of forensic exhibits. However, there are still a few limitations that have been observed in this research, including the proper preparation and care of every sample, as the slightest contamination may result in a slight change in the results. To reduce the contamination, samples need to be properly placed in sealed plastic bags to avoid errors in the repetition.

Conclusion

The proof-of-concept study shows that rapid individualization of the cream samples to the source of creams, even after exposure to different substrates, can be demonstrated. In summary, this study investigated a rapid, non-destructive method for identifying facial creams on various substrates with 100% accuracy, providing important evidence, especially in assaults involving women. For future work, it is intended to explore deposits of creams in different environments with different durations (i.e. one year, two years), and it would provide significant forensic value in the community.

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SELF-PERCEPTION, CONCERNS AND DEMANDS REGARDING TEETH WHITENING AMONG PRECLINICAL MEDICAL STUDENTS IN MUCM

EXTENDED ABSTRACT 08

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Keywords: teeth whitening, self-perception, concerns, demands

Introduction

The World Dental Federation (FDI) defines oral health as an individual's physical, mental, and psychological well-being. This explains why dental treatments are so important for a person's overall health and well-being [1]. Physical aesthetics has become an increasingly essential facet of society in our century, with dental aesthetics being one of the distinguishing features of a beautiful face. This explains why the demand for dental operations has skyrocketed in recent years [2]. Everyone has a unique perception of tooth colour. As a result, they may be less concerned about tooth whitening procedures. Gender, age, ethnicity, socioeconomic level, social media, and familial influence may all influence how a person perceives teeth whitening operations [3]. The relationship between teeth whitening and social contact, as well as self-confidence, has to be investigated and evaluated [4]. Most people who undergo teeth whitening procedures do so to improve their appearance, thus it is reasonable to assume that tooth colour is the most important aspect linked with tooth aesthetics [5]. This study aimed to evaluate self-perception, concerns and demands of teeth whitening among preclinical students in Manipal University College Malaysia, MUCM.

Methods

Study population

Preclinical medical students were recruited by simple random sampling methods. The sample size was estimated at 200. They were sought between early September and November 2023.

Ethical approval

Prior to data collection, the Research Ethics Committee at MUCM, Melaka approved the study's ethical conduct. Participants were provided consent form along with the questionnaire. The ethical number for this study is MUCM/REC – 070/2022.

Questionnaire

A structured online questionnaire was used to collect socio-demographic information, self-perceptions, concerns, and demands for teeth whitening. The content of the questionnaires had been verified by dentists working at MUCM and pre-tested among 20 students for comprehension before they were circulated for a real survey.

Results

Sociodemographic Profiles

A total of 249 male and female students volunteered to participate in this cross-sectional study. The majority of subjects (66.3% n=165) were females, with the remaining males accounting for 33.7% (n=84) of the 249 total students. Almost half of the subjects (n=113, or 45%) are under the age of 19. The remainder subjects' range in age from 20 to 26. A

total of 70 students (28.1%) had parents who earn more than RM10,000 per month.

Self-perception on Teeth Whitening

According to the results of the subjects' self-perception of teeth whitening, most subjects (96%, n=240) are aware of teeth whitening and the subjects that believe healthy and whitened teeth are important for your appearance is about 93.4% (n=232). Furthermore, most individuals (94%, n=234) believe that having white teeth increases their self-confidence.

Concerns about Teeth Whitening

In the area concerned, 81.5% (n=203) of the individuals were concerned about tooth colour. More than half of the individuals (58.2%, n=145) are concerned about the colour of their teeth and are uncomfortable with face-to-face conversation if their teeth are not white. Furthermore, 79.9% (n=199) believed that tooth colour is related to oral hygiene. Only 27.3% (n=68) had attempted to whiten their teeth. 68.3% (n=171) of the individuals believed that tooth whitening had side effects.

Demands for Teeth Whitening

In terms of demands for teeth whitening, just a small majority (57%, n=142) of individuals thought their teeth needed to be whiter. Personal preference was chosen by 68.7% (n= 171) of the individuals as the reason for needing teeth whitening. In terms of teeth whitening methods, the majority of subjects (77.9%, n=194) agree that consulting a doctor is preferable to using over-the-counter teeth whitening products and home remedies.

Relationship between Concerns and Demands

The correlation test for the relationship between concerns and demands was done. The study revealed a weak positive correlation ($r: 0.318, p < 0.05$) between concerns and demands.

Discussion

It is true that 90% of individuals felt that having white teeth is a significant aspect of their appearance and that having white teeth can boost their confidence. It is crucial to note, however, that while teeth whitening can improve the appearance of your teeth, it is not a replacement for basic oral hygiene [6]. However, it is important to understand that maintaining the colour of your teeth is not only related to oral hygiene but also to various lifestyle factors. For example, smoking and consuming foods

and beverages that are high in caffeine can cause staining and discolouration of teeth [7].

Furthermore, 58.2% of the individuals in this survey are self-conscious about the colour of their teeth due to a lack of understanding about available teeth whitening treatments on the market. However, as the pandemic continues, some people may have become less concerned about the appearance of their teeth as a result of wearing masks that hide their lips [8]. The relationship between concern and demand is weak positive ($r: 0.318, p < 0.05$). The investigation yielded similar results: Hospital Universiti Sains Malaysia (HUSM) patients desired tooth whitening in 56.3% of cases [9]. The experiment produced similar results: 56.3% of HUSM patients sought dental whitening [9]. In comparison, 77.7% of subjects in Riyadh [3] 76% in Hong Kong [10] had their teeth whitened. Only a minor increase in demand is the result of increased concern, which may be related to disturbing side effects (68.3%), teeth that are less visible due to face masks, and high levels of prior self-confidence.

Conclusion

Our study showed that among preclinical students in MUCM, there is a positive weak correlation between concern and demands. Self-perception of subjects towards their own teeth' colour is important once they are dissatisfied with the colours. A slight increase in the demand for teeth whitening may only be marginally influenced by adverse effects.

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THE EFFECT OF MEDICINAL PLANTS ON ENDOTHELIAL FUNCTION AND ATHEROSCLEROSIS: A MINI REVIEW

EXTENDED ABSTRACT 9

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Keywords: atherosclerosis; cardiovascular disease; endothelial dysfunction; endothelium; medicinal plants

Introduction

Cardiovascular diseases (CVD) constitute one of the major causes of disability and death all over the world. The World Health Organization estimates that 17.9 million people died from CVD in 2016, with coronary artery disease and stroke accounting for 85% of these fatalities [1]. The primary cause of CVD is the development of atherosclerosis resulting from endothelial dysfunction (ED) and chronic inflammation. ED is defined as the imbalances between vasoconstrictors and vasodilators and initiates several events that promote or exacerbate atherosclerosis [2]. ED is reversible and can be identified before structural alterations to the artery wall are seen on angiography or ultrasonography, making it a potential early indicator of atherosclerosis. Impairment to endothelial function contributes to several events that further or aggravate atherosclerosis. These include increased endothelial permeability, platelet aggregation, leukocyte adhesion, generation of cytokines, proliferation and migration of smooth muscle cells which ultimately results in plaque formation and intimal thickening [3].

Moringa oleifera is also known as Pokok Kelor. It is usually found in India. The leaves are rich with mineral and vitamins thus the extracts of leaves are commonly used for various health benefits. It can be used as an antioxidant, anti-inflammatory and even anti-cancer agent. It is known that *Moringa oleifera* provides vitamins and minerals in many more folds compared to natural fruits and vegetables. It is also used in children with malnutrition to get the children back to their normal growth and development. This plant is sensitive to drought and winds thus a lot of care needs to be given to ensure a conducive environment for growth. The

different locations will vary the nutritional content of *Moringa*. For example, in very high temperatures, proteins and enzymes present in the leaf get denatured causing the subtle differences. It is also important to consider the soil and fertiliser used as it is the foundation to a well-growing plant and nutrition for the plant [4].

Allicin is a compound derived from Garlic also known as *Allium sativum*. Through a variety of ways, allicin improves endothelial function. First and foremost, it has strong antioxidant capabilities that aid in reducing oxidative stress, a primary cause of endothelial dysfunction. Additionally, it has been demonstrated that allicin increases endothelial cell nitric oxide (NO) production. This improved endothelium-dependent vasodilation, decreased blood pressure, and improved vascular health are all benefits of this increased NO availability. Allicin also has anti-inflammatory qualities, preventing the formation of cytokines and adhesion molecules which foster inflammation. The garlic compound allicin is essential for maintaining and improving endothelium function. Its antioxidant, nitric oxide-boosting and anti-inflammatory attributes reduce inflammation, fight oxidative stress, and promote vasodilation, all of which improve vascular health [8].

Morinda citrifolia, also known as Noni or buah mengkudu, is native to Southeast Asia, including Indonesia, and Australia. Noni is renowned for having a very broad tolerance for environmental factors. It thrives in extremely dry to extremely moist environments and may grow on infertile, acidic, and alkaline soils. Noni continuously blooms and produces fruit all year long. Noni has been utilised by Polynesian peoples in folk medicine for over 2,000 years. Conditions including arthritis, pain, infections, and constipation are routinely

treated with it. Noni also consists of several actions like anti-inflammatory, antioxidant and antihypertensive [9].

Asiatic pennywort, also known as *Centella asiatica*, is a small herbaceous plant native to Asia. It is commonly used in traditional medicine such as Ayurveda and Traditional Chinese Medicine for its medicinal properties. It is known for its potential health benefits, including promoting wound healing, reducing inflammation, and antihyperlipidemic properties. The plant is often consumed as a leafy vegetable and is also available in supplement or topical form [7].

Curcuma longa, commonly known as turmeric, is a plant that belongs to the ginger family. It is native to Southeast Asia and is extensively cultivated in tropical regions worldwide. In traditional medicine, turmeric has been used to treat various ailments due to its potential anti-inflammatory and antioxidant properties. It has been associated with a range of health benefits, including supporting digestion, relieving arthritis symptoms, boosting the immune system, and promoting heart health. Turmeric is also used as a spice in many cuisines [7]. *Clinacanthus Nutans Lindau*, also known as belalai gajah (Malay), and by several other names in different regions is a perennial plant in the Acanthaceae family. *C. nutans* has been used to treat insect bites, reactions to allergens, and herpes simplex and Varicella-zoster virus (VZV) lesions. It's also a traditional herbal medicine used in Malaysia, Indonesia, Thailand, Singapore, and China to treat skin rashes, insect, snake bites, herpes simplex virus (HSV) lesions, diabetes, and gout. It has anti-inflammatory antioxidants, anti-venom and anti-dengue activity. An ethanol extract of the aerial section inhibited the release of superoxide anion and elastase by activated neutrophils. Some cancer patients believe that consuming *C. nutans* leaves has helped them treat their illness and improve their health, however, there are no clinical studies to back up these claims. In conclusion, we can say that *Clinacanthus nutans* is a perennial plant with therapeutic properties, but further research is needed to establish its efficacy and safety [5].

In this review, the role of medicinal plants such as *Moringa oleifera*, *Clinacanthus nutans*, *Curcuma Longa*, *Centella Asiatica*, *Allicin*, *Piper sarmentosum* and *Morinda citrifolia* on endothelial function and atherosclerosis were discussed.

Objectives

The general objective of this study is to explore the role of medicinal plants in cardiovascular health. The specific objectives include investigating the effects of medicinal plants on endothelial function, examining

their anti-inflammatory properties, and evaluating their antioxidant effects.

Methodology

This study is a short narrative review focused on cardiovascular health. The review includes studies on populations with cardiovascular disease, diabetes, and healthy individuals, incorporating both animal and human studies. No exclusion criteria were applied. Data was collected from PubMed and Google Scholar, with the review covering studies published between September 2022 and February 2023. The keywords used for data collection included atherosclerosis, cardiovascular disease, endothelial dysfunction, endothelium, and medicinal plants.

Results and Discussion

Table 1 highlights the effects of several plant extracts on vascular function, oxidative stress, and blood pressure. *Moringa oleifera* in hypertensive rats improved endothelium-dependent relaxation, reduced oxidative stress (superoxide and malondialdehyde), enhanced antioxidant enzyme activity (superoxide dismutase and catalase), and lowered blood pressure [4]. *Clinacanthus nutans* in diabetic rats increased endothelium-dependent relaxation and endothelial nitric oxide synthase activity while reducing contractions. *Curcuma longa* in healthy adults increased nitric oxide-mediated endothelial function, reduced oxidative stress, and improved vascular relaxation [5]. *Curcuma longa*, *Centella asiatica* and *Allicin* both decreased arterial stiffness and blood pressure in hypertensive rats through nitric oxide pathways [6-8]. Similarly, *Morinda citrifolia* and *Piper sarmentosum* enhanced nitric oxide production, endothelium-dependent relaxation, and antioxidant activity, leading to reduced blood pressure in hypertensive and nicotine-induced rats, respectively [9-10].

Table 1. The effects of several plant extracts on vascular function, oxidative stress, and blood pressure

Plant name	Population/ Parameters	Outcome/ Mechanism	Ref
<i>Moringa oleifera</i> (60mg/kg/day) - 3weeks	Hypertensive Male Wistar rats • Mesenteric artery – Endothelium Dependent Relaxation & Endothelium Dependent Contraction	Increased Endothelium Dependent Relaxation Decreased Endothelium Dependent Contraction.	[4]

	<ul style="list-style-type: none"> • Oxidative stress <ul style="list-style-type: none"> ○ superoxide production (O₂^{•-}) ○ malondialdehyde (MDA) ○ superoxide dismutase (SOD) ○ catalase (CAT) activities. • Blood Pressure 	<p>Decreased vascular O₂^{•-} & malondialdehyde levels.</p> <p>Increased Superoxide Dismutase & Catalase.</p> <p>Decreased Blood Pressure.</p>	
<i>Clinacanthus nutans</i> (500mg/kg/daily)-4 weeks	<p>Streptozotocin-induced diabetic Sprague Dawley rats.</p> <ul style="list-style-type: none"> ▪ Aorta Endothelium Dependent Relaxation ▪ Endothelial nitric oxide synthase - Western blotting 	<p>Increased Endothelium Dependent Relaxation associated with Increased endothelial nitric oxide synthase. Decreased Endothelium-dependent & independent contractions.</p>	[5]
<i>Curcuma longa</i> (2000 mg/day) -12 weeks	<p>Healthy middle-aged and older adults.</p> <ul style="list-style-type: none"> ▪ Brachial Flow Mediated Dilation- Endothelial function ▪ Nitric Oxide-mediated endothelial function ▪ Oxidative stress-mediated suppression of endothelial function 	<p>Increased Endothelium Dependent Relaxation. Increased Nitric Oxide-mediated relaxation. Decreased Oxidative stress suppression of Endothelium Dependent Relaxation.</p>	[6]
<i>Curcuma longa</i> & <i>Centella asiatica</i> (50 and 100 mg/kg)-4 weeks	<p>Hypertensive Wistar rats</p> <ul style="list-style-type: none"> ▪ Pulse Wave Velocity ▪ Nitric Oxide ▪ Blood pressure 	<p>Decreased Arterial stiffness. Increased Nitric Oxide. Decreased Blood Pressure.</p>	[7]
Allicin (7 mg/kg and 14 mg/kg)-4 weeks	<p>Hypertensive Sprague Dawley rats</p> <ul style="list-style-type: none"> ▪ Mesenteric artery- Endothelium Dependent Relaxation ▪ Blood Pressure 	<p>Increased Endothelium Dependent Relaxation (Nitric Oxide, PGI₂ and</p>	[8]

		<p>Endothelium Dependent Hyperpolarizing Factor pathways). Endothelium independent vasodilation. Decreased Blood Pressure.</p>	
<i>Morinda citrifolia</i> (15 ml/kg) for 6 weeks	<p>Hypertensive Wistar rats</p> <ul style="list-style-type: none"> ▪ Aorta- Endothelium Dependent Relaxation ▪ Intracellular Nitric Oxide production ▪ HUVEC cell culture- Nitric oxide ▪ Blood Pressure 	<p>Increased Endothelium Dependent Relaxation. Increased endothelial nitric oxide synthase. Increased phosphorylation endothelial nitric oxide synthase. Decreased Blood Pressure.</p>	[9]
<i>Piper sarmentosum</i> (250 mg/kg/day)- 3 weeks	<p>Nicotine-Induced Sprague Dawley Rats</p> <ul style="list-style-type: none"> ▪ Thoracic aortae – Endothelium Dependent Relaxation ▪ Vascular nitric oxide level ▪ Antioxidant (Superoxide Dismutase and Catalase) 	<p>Increased Endothelium Dependent Relaxation. Increased Nitric Oxide. Increased superoxide dismutase & catalase activity.</p>	[10]

Conclusion

Based on the studies in our review, it has been shown that medicinal plants prevent endothelial dysfunction by promoting endothelium-dependent relaxation and reducing oxidative stress. Though medicinal plants help in ameliorating endothelial dysfunction, most studies involved animal studies. Therefore, there is a need for more in-depth research and clinical trials to understand the potential of these substances.

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ANTIDIABETIC AND ANTIOXIDANT ACTIVITY OF GINGER (*ZINGIBER OFFICINALE*) EXTRACTS: A MINI REVIEW

EXTENDED ABSTRACT 10

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Introduction

Diabetes mellitus (DM) is a group of metabolic disorders sharing the common feature of chronic hyperglycaemia, which can be caused by a deficiency in insulin secretion, insulin resistance, or both. DM can be generally classified into 2 types, mainly Type 1 DM (T1DM) and Type 2 (T2DM). T1DM is an autoimmune disease characterized by pancreatic beta cell destruction and an absolute deficiency of insulin while T2DM occurs due to a combination of peripheral insulin resistance and inadequate secretory response by pancreatic beta cells [1]. It has been a major illness impacting over 400 million people worldwide, with considerable morbidity and mortality rate. In 2019, 3.6 million adults in Malaysia were reported to be diabetic and 49% of the cases were undiagnosed. T2DM is the most common among the cases and females are reported to be affected more than males. According to the national survey report, about 7 million adults aged 18 and older will be affected by diabetes by 2025 [2]. The possible causes of the increasing prevalence of T2DM might be due to obesity, unhealthy diet, and physical inactivity among Malaysians. The chronic hyperglycaemia of diabetes can lead to life-threatening complications for patients involving damage and dysfunction of organs including blood vessels, heart, kidney, and eyes [3]. Acute complications of DM include diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state (HHS). They are known to be medical emergencies, precipitated under severe stress like serious infection and trauma [4]. The burden of DM on our country's citizens is expected to be increasing

drastically from 2011 to 2019, posing a major threat to our healthcare system [5].

Although there are numerous studies inquiring about the pathophysiological basis of DM, the exact functional mechanism behind diabetic complications remains unclear. One of the major mechanisms discussed is the role of oxidative stress, a well-known cause of various pathological conditions and illnesses. Oxidative stress is defined as any imbalance between Reactive Oxygen Species (ROS) and antioxidants, resulting in the uncontrolled production of free radical species that disrupt normal biological homeostasis [6]. ROS like hydrogen peroxide, superoxide, and hydroxyl radical ions are produced endogenously at low levels mostly in the mitochondria and peroxisomes. Low physiological levels of ROS act as signalling agents in the body, but excess ROS produced is a damaging agent in the body. Excess free radical formation has been concluded to have a direct impact on the progression of various chronic diseases including T2DM. Oxidative stress is proven to play a pivotal role in disrupting normal insulin signal transduction and thus initiating a deleterious pathway toward insulin resistance development. Therefore, the complex interaction between DM and oxidative stress suggests that substances with strong antioxidant properties can be potentially utilized as anti-diabetic treatment [7].

Over the years, different treatment approaches including insulin injection and oral pharmaceutical drugs such as sulfonylureas, biguanides, and Dipeptidyl peptidase-4 (DPP4)-inhibitors have been used in the management of diabetes. Undeniably, they are proven to be effective in controlling the rising of blood glucose levels via

different mechanisms particularly stimulating insulin secretion and reducing gluconeogenesis from the liver. Other than that, newly discovered drugs such as acarbose and miglitol which inhibit both α -amylase and α -glucosidase enzymes are useful in reducing postprandial hyperglycaemia, especially in T2DM, via inhibition of glucose absorption from the intestines. Nonetheless, extended usage of these oral pharmaceutical drugs elicits a range of adverse side effects like hypoglycaemic episodes, nausea, vomiting, abdominal discomfort, and weight gain. Other than the adverse effects of current anti-diabetic management, contraindications of some medications during pregnancy and the expensive cost of drugs have led to a growing interest in the research of natural products as an alternative in medicinal uses and as functional foods in diabetes mellitus [8].

Herbal medicine has been an important therapeutic agent in alleviating diseases in humankind over the last 2500 years. Medicinal plants have been strongly evidenced and practised in traditional medicine systems in various cultures, including Chinese, Indian, and Arabic [9]. Medicine derived from plant extracts has been shown to be comparatively cheaper than modern drugs and yet clinically effective. To illustrate further, turmeric is a spice with powerful anti-inflammatory effects and is commonly used in the alleviation of joint pain [10]. Willow bark, which contains salicin, has been used as a natural pain reliever for centuries [11]. It has also been reported that consuming plant-based foods that contain polyphenols can lead to effects comparable to those of insulin and act as great inhibitors of α -amylase and α -glucosidase enzymes. Some notable examples of medicinal plants that are reported to elicit hypoglycaemic properties are cinnamon (*Cinnamomum verum*), Ginseng (*Ficus macrocarpa*) and Ginger (*Zingiber officinale*). It is believed that the blood sugar-lowering mechanisms of these medicinal plants may be associated with their chemical composition that are abundant in alkaloids, phenolics, and flavonoids. Thus, this review aimed to summarize evidence of the antidiabetic activity of ginger (*Zingiber officinale*) extracts and provide suggestions for future development of ginger extracts as antidiabetic medication or functional products.

Methods

This study is a narrative review. Data was obtained from online databases including Scopus,

ScienceDirect, Google Scholar, and PubMed as reported in the last 3 years (2020–2023). Searches were done using a combination of the terms “*Zingiber Officinale*”, “antidiabetic”, “antioxidant” and “diabetes mellitus”. The inclusion criteria are all studies within the period of interest between 2020–2023 while the exclusion criteria are previous studies that were conducted before 2020. The reasons for choosing studies within the last 3 years are as follows: (1) Relevance and up-to-date information, (2) Accuracy and more reliable results, (3) Avoiding misinformation, as some outdated research may contain information that has been superseded or even debunked by newer studies. The studies selected were not restricted only to studies with randomised controlled trials, instead, a broader range of study designs was considered.

Results and discussion

Major bioactive compounds of ginger extract are mainly phytochemicals such as the flavonoids, phenolic and sesquiterpenes (Figure 1). These components are reported to contribute to its antidiabetic capabilities. For instance, a study reported that 6-gingerol, which is one of the major phenolic compounds found in ginger, reduced renal dysfunction biomarkers in streptozotocin (STZ)-induced diabetic animals [12]. Apart from the renal protective effects, 6-gingerol also demonstrated a shielding effect against hepatic inflammation, which is the underlying pathogenesis of insulin resistance and T2DM [13]. Another phytoconstituent of ginger, 6-shogaol, is reported to enhance the intestinal barrier function, reduce the uptake of glucose and glucose transport, which is useful in the management of T2DM [14].

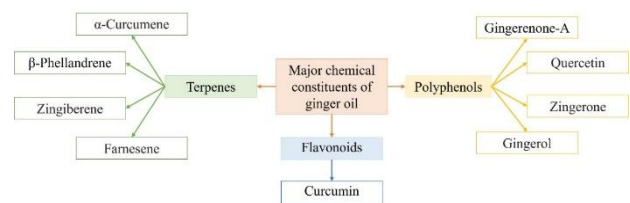


Figure 1. Major chemical constituents of ginger extracts.

The major studies reporting ginger plants as anti-diabetic agents is highlighted Table 1, which summarizes the type of ginger extract used, experimental model, outcome and probable mechanism of action that contributes to their ability to increase insulin sensitivity and regenerate pancreatic beta cells.

Table 1. Antidiabetic studies of ginger extracts

Type of extracts/ Constituents	Experiment Model	Outcome	Ref
Ag/CuO nanocomposites (NCs) using Zingiber officinale green extracts	<i>In vitro</i> inhibition activity against enzymes	The presence of high amounts of flavonoid and phenolic compounds may be a cause for the antidiabetic activity of ginger extracts. Ginger extracts revealed high inhibitory activity against α -amylase, α -glucosidase, and glucose-6-phosphatase enzymes.	[15]
Aqueous ginger extract (Dose of 200 - 400 mg/kg body weight)	Diabetic alloxan-induced Wistar rats	Ginger is shown to effectively reduce blood sugar levels, thus effective in preventing diabetic mellitus and its complications. It is also proven to protect against dyslipidaemia in diabetic patients by increasing HDL-C levels and reducing TC, LDL-C, and TG concentrations in diabetic animals.	[16]
Ginger extract (Dose of 250 mg/200 grBW)	Streptozotocin-induced diabetic rats	Ginger extract alone showed an increase in insulin levels and hypoglycaemic properties after 14 days. However, a combination of both ginger extract and cinnamon extract shows better antidiabetic properties.	[17]
Ginger extract (Dose of 250 mg/200 grBW)	Streptozotocin induced diabetic	Ginger is effective in modulating the	[18]

	Wister albino rats	histopathology of the liver and pancreas of diabetic-induced animals. It is also proven to alter the level of blood sugar and insulin in diabetics.	
Ginger tablets (1500 mg daily in three meals)	Randomized double-blind placebo-controlled clinical trial	Compared to the placebo group, ginger tablet significantly improves the fasting blood sugar and serum insulin in women with gestational DM.	[19]
Normal ginger extracts and steamed ginger extracts	Alloxan-induced diabetic adult zebrafish	Steaming process proved to enhance the anti-diabetic effect of ginger extracts by increasing the activity of pancreatic islets via inhibiting K ⁺ ATP channels.	[20]

Conclusion

In summary, ginger extracts have great potential to be developed as antidiabetic medication. We anticipate that the findings from this review paper serve as a reference and provide an update for available scientific information on the antidiabetic potentials of ginger extracts and their constituents. It is also important to note that the antidiabetic studies pertaining to ginger extracts and their constituents are limited to *in vitro* and *in vivo* studies, which hinders their progress in the drug discovery and development pipeline. Future work is recommended to progress into clinical trials to expedite the development of antidiabetic drugs or functional products derived from ginger extracts.

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KNOWLEDGE, ATTITUDES AND PRACTICE OF A PRIVATE UNIVERSITY COLLEGE STUDENTS TOWARDS THE CONSUMPTION AND HEALTH BENEFITS OF FERMENTED FOODS

EXTENDED ABSTRACT 11

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Keywords: attitude, fermented foods, knowledge, practice, probiotic

Introduction

Food fermentation is one of the oldest methods of food preservation. It is an ancient technique used for preservation, especially perishable food. Fermented foods are defined as foods or beverages prepared through controlled microbial growth and enzymatic conversions of food components [1]. It has been part of the human diet in many different countries since the beginning of civilization. There is a rise in the demand for fermented foods when people observed the enhancement effect of the taste and texture after the foods undergo the process of fermentation. Apart from that, people also realized that fermentation had benefits beyond these. Fermented foods not only have a prolonged shelf life, variety of tastes, and texture but also enhance nutritional and functional properties, which have been often linked to a wide range of health benefits in humans [2]. The nutritional and therapeutic effects of fermented foods had drawn the public's attention. Although fermented foods are well accepted and consumed by the public, there are still many people especially the young generation who do not have the knowledge of it. People do not even realize some of the famous daily diets they consume are produced through the fermentation process, also the fact that the beneficial effects of fermented foods are due to the presence of probiotics. Therefore, the present study was conducted with the main objective to evaluate the knowledge, attitude, and practice of MUCM students towards the consumption and benefits of fermented foods.

Methods

The study was approved by the Ethics Committee of Manipal University College, Malaysia with the reference code: MUCM/REC – 069/2022. A cross-sectional study was conducted by including 284 students from Bachelor of Medicine, Bachelor of Surgery (MBBS), Bachelor of Dental Surgery (BDS), and Centre for Foundation and General Studies (CFGS). Content validity and reliability test had been carried out before the questionnaire was distributed online. The questionnaire consisted of four main sections. Section A was related to the demographic data of the respondents. Section B consisted of general questions about their knowledge of fermented foods. Section C was on their practice whereas Section D was the students' attitude towards fermented foods. The sample size was calculated by using an adjusted single population proportion formula, giving rise to a final sample size of 249 [3]. Data analysis was conducted using IBM® SPSS for Microsoft Windows® version 23.0. The results obtained were represented in the form of frequency, percentage, mean and standard deviation. The data was subjected to descriptive analysis and meaningful classification.

Results and Discussion

Demographic information was included to have a better understanding of how the different characteristics of the respondents would influence their knowledge, attitude, and practice towards the consumption and health benefits of fermented food.

From the data collected, out of the total number of 284 participants, the majority were female, which is 208 (73.2%), within the age group of 18-20 (54.6%). This is in accordance with many studies conducted all over the world on the ratio of females to males in tertiary enrolment. According to the statistic shown by Hirschmanni year 2021 [4], there is a high proportion of females enrolling in higher education institutions as compared to males from 2012 to 2020 in Malaysia. The data showed a gradual decrease in the number of males enrolled in higher institutions. Indian students were the major respondents, who attributed 131 (46.1%). This is followed by Chinese, Malay, and other students in the descending order of 38.7%, 7.7%, and 7.4%, respectively. This survey was participated by 153 (53.9%) participants from MBBS, which is the faculty that had the highest students' number as compared to the other two, which are BDS (39.8%) and CFGS (6.3%). In addition, those students who participated are mainly from Malacca (n= 174). This might probably be due to the location, which is near Manipal, Malacca. From this study, we can notice that distance is one of the factors considered by students who are going to enrol in a tertiary study.

This study showed that most of the respondents had a good knowledge of fermented foods and products. It accounted for 99.6% (n=283) whereas those who had poor knowledge of fermented foods were only 0.4% (n= 1). This finding might be closely related to their bachelor's degree education background, which is related to science. Their course of study might expose them to knowledge related to the fermentation process, fermentation foods, and probiotics. Our study revealed that most of the respondents (n=207), believed that fermented products are good for human health. There are 201 respondents, which is 70.8% aware that there is a group of friendly bacteria known as probiotics present in fermented foods. The finding reflected 181 respondents knew that the beneficial effects of consuming fermented foods were due to the presence of probiotics. Sony and his group [5] conducted surveys on health professionals to assess their knowledge, attitude, and practice about probiotics in the year 2018. The finding showed that most of the participants were aware of the term probiotic. This reflected that people with a science background are more aware and possess the knowledge of probiotics. In addition to the educational background, social media has had a great impact in delivering knowledge on fermented foods and the benefit of probiotics to people. It is undeniable that many platforms can be used for advertising fermented foods like yoghurt, cheese, and kimchi which are easier to reach to the public and draw their attention. For example, Yakult, a probiotic culture drink that is popular always appears on social media such as television, radio,

and Facebook. Therefore, social media would be a tool for delivering knowledge of fermented foods to the public.

The study indicated that most of the respondents showed a good attitude towards the consumption of fermented foods, which accounted for 98.9%. 136 of the respondents strongly agreed and agreed that consuming fermented foods will benefit their health, and 71 respondents felt that consumption of probiotics may prevent the side effect of antibiotics. As we know, antibiotics are the drug that kills and slows down the growth of bacteria that cause infection and harm to our body. However, consuming an immoderate amount of antibiotics can cause liver damage and thinning of the wall of the intestine. The consumption of fermented foods helps to deliver the probiotics to the gastrointestinal tract which favours the growth of normal flora, and at the same time inhibits the invasion of pathogenic microorganisms [6]. There is only a minority of participants (n=14) who disagreed that fermented foods taste nice. The majority of the respondents agreed that fermented foods taste nice. They felt that fermented foods give a variety of flavours, textures, and aromas. This group of respondents is willing to learn and share their knowledge about fermented food with others.

Based on the result we obtained, a majority of the respondents also showed good practice towards the consumption of fermented foods. It makes up 98.6% of the total respondents who took part in this research survey. There are a total number of 276 respondents (97.2%) mentioned that they did consume and try on fermented foods before. The higher number might be due to the unique desirable taste, aroma, texture, and appearance of the fermented foods that had been advertised by social media. People tend to give a try to these fermented foods due to the influence of social media. Moreover, the beneficial effect exerted by fermented foods also encourages people to consume them. Nowadays, fermented foods from different regions and countries can be easily accessed by people at local grocery shops and hypermarkets. With the advance of technology and online service, it makes the purchasing process even easier. 236 respondents from those who had consumed fermented foods and products did recommend these types of foods to their friends and family. It reflected that the respondents who had tried on the fermented foods felt good about the products or noticed the beneficial effect which encourages them to recommend and promote it to others. It is a common practice that people will tend to introduce and share something good and beneficial to others once they had experienced it.

Conclusion

The study revealed that the majority of the MUCM students have a good knowledge of fermented foods. They showed a good attitude and practice toward the consumption of fermented products. This is not surprising as people nowadays focus on a healthy lifestyle and tend to know more about a healthy diet that can benefit their health. These research findings not only give evidence on the extent of knowledge, attitudes, and practice among the young generation, create awareness among them of the advantages of consuming fermented products, but also provide perspectives for further investigation on the potential probiotic for the research of novel fermented food products.

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STUDY ON THE LEVEL OF AWARENESS OF HEALTH ISSUES INVOLVED IN CYBERADDICTION AND WILLINGNESS TO CHANGE AMONG MEDICAL STUDENTS

EXTENDED ABSTRACT 12

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Keywords: cyberaddiction, medical students, willing to change, cross-sectional study, MUCM

Introduction

The Internet has been continuously evolving across all industries worldwide, including the medical field. Hence, cyberaddiction also known as internet addiction disorder (IAD) has become a major problem among medical students not only in Malaysia but globally [1]. Even though medical students take advantage of and use the Internet for academic resources, purposes and benefits, they also utilise and abuse the Internet for their recreational purposes as one of the coping mechanisms for the stress incurred by their heavily burdened medical studies [2]. The extent to which medical students at Manipal University College Malaysia (MUCM) are aware of their internet addiction and their willingness to address this unhealthy habit remains unclear and warrants further exploration. This research aims to address this significant yet overlooked issue, which has already become a silent and growing global addiction problem. Our objectives are to determine whether MUCM students recognize their internet addiction, assess their willingness to change this behavior and evaluate whether cyberaddiction is a major or minor issue among the student population at MUCM.

Methods

A cross-sectional study design was employed to investigate cyberaddiction among medical students at Manipal University College Malaysia (MUCM). Data were collected over a six-month period, from September 2022 to February 2023, encompassing demographic variables such as gender, age, and socioeconomic status. The study sample consisted of

Year 1 and Year 2 undergraduate students from the MBBS and BDS programs, including both male and female participants. A total of 209 students were selected using a simple random sampling technique, with the sample size determined through a random number generator software. Data were gathered via a Google Forms questionnaire distributed to the selected students. The questionnaire included a series of questions related to cyberaddiction, with participants responding using a Likert scale ranging from "strongly agree" to "strongly disagree." The questionnaire was adapted from a validated study conducted at Universiti Sultan Zainal Abidin that explored internet addiction among medical students [3]. The responses were compiled in Google Sheets and analyzed as percentages, which were subsequently presented in various chart formats. Ethical approval for the study was granted by the Research Ethics Committee of MUCM (Reference Number: MUCM/REC – 073/2022).

Results

A total of 209 students participated in this study by completing a questionnaire distributed via email. The respondent pool comprised 72.7% female and 27.3% male students. The majority of respondents (over 91%) fell within the 19–21-year age range, with a smaller proportion (2.9%) being 23 years old. The student population was predominantly composed of MBBS students (75.1%), with the remaining 24.9% being BDS students. Furthermore, Year 1 students constituted a larger portion of the respondents (73.7%) compared to Year 2 students (26.3%).

The questionnaire explored students' perspectives across five key categories:

Distinguishing Addiction, Correlation of IAD with Mental Illness, Acceptance, Loss of Face, and Willingness to Change. Firstly, less than 6% disagreed with the distinction between being an occasional internet user and being addicted. Secondly, a little over half of the students (50.3%) indicated awareness of the correlation between Internet Addiction Disorder (IAD) and mental illness, having gained this information from sources such as doctors or other media (e.g., online articles and newspapers). However, when probed further, a substantial proportion of students reported a lack of awareness regarding the diagnostic criteria for IAD as a mental illness (67.9%) and the availability of clinic centers specializing in IAD treatment (70.3%). Thirdly, many students (49.8%) found it easy to be convinced that IAD is a mental illness, and a similar proportion (52.2%) could readily accept friends being considered as IAD mental patients. Upon further inquiry, a slightly smaller, yet still considerable, percentage (49.2%) indicated an ease in accepting a family member being regarded as a mental patient. Fourthly, a significant majority of students (69.5%) expressed a fear of the loss of face associated with mental illness. Lastly, an overwhelming majority of respondents (69.6%) demonstrated a willingness to change their internet habits. They indicated a preference for adopting strategies such as reading books, seeking help to monitor their internet usage, setting time limits, and participating in outdoor sports.

Discussion

Internet addiction (IA) has been recognized to generate the symptoms of addiction like the one produced by nicotine, alcohol, or drugs. It has been defined as the psychological dependence on the Internet, regardless of the activity once logged on [4]. IA is also characterized by excessive or poorly controlled preoccupations, urges, or behaviours regarding computer use and Internet access that lead to impairment or distress [5].

Therefore, the current research aims to elucidate the level of awareness concerning cyberaddiction in medical students and their willingness to change the habit of cyberaddiction with other activities by examining the parameters contained in the questionnaire. The parameters that were included in our questionnaire were the ability to distinguish between the addict and occasional internet user, awareness that IAD is a form of mental illness, acceptance of IAD as a mental illness, loss of face and willingness to change internet habits. Among 209 respondents, 68.1% of students can distinguish between a regular internet user from an internet addict with 48.1% of students aware that IAD is a mental illness. 23.5% of students were found it difficult to accept their family members as IAD

mental patients while 49.2% of them seemed to disagree with the stigma and willingly open to accepting IAD patients involving their family members. 69.4% and 77.5% of students acknowledged that a person with mental illness feared letting other people know and ridiculed them for their conditions as an IAD patient. Moreover, 47.4% and 78% of the students agreed that newspaper and book reading as well as engaging in sports activities can be a substitute to change the bad internet habits. In another way, 66% of students would seek the help of people around them to control their cyberaddiction while 77.1% of them can set the limit on themselves to control their internet usage. This study highlights the awareness of cyberaddiction among medical students at MUCM and presents a list of activities they are willing to engage in to improve their internet habits. However, a key limitation of the research is the lack of in-depth analysis to explore potential associations between the various parameters assessed in the questionnaire.

Conclusion

In a nutshell, the majority of students in the university have realised and have been alerted that cyberaddiction has become a trend and ultimately created a serious problem towards individuals as well as society. Bad internet habits have affected students not only physically but mentally as well. They are trying to overcome the problems with methods such as replacing the internet with reading books, newspapers, articles and others, self-disciplines to restrict and limit their internet usage and seeking help from a friend or professional help. It is strongly recommended that future research focuses on children in primary and secondary schools, as they often lack self-control and struggle to differentiate between right and wrong. Identifying the issue early is crucial to prevent it from escalating into a larger problem that could impact both families and society.

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NANOMEDICINE – A VERSATILE TOOL IN MANAGING DIABETIC WOUNDS: A MINI REVIEW

EXTENDED ABSTRACT 13

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Keywords: nanotechnology, nanoparticles, diabetes, wound healing

Introduction

Diabetes mellitus is a complex metabolic disorder that is associated with hyperglycemia and multiple organ impairment [1]. It can be classified into type 1 and type 2, where type 1 is associated with autoimmune damage of pancreatic beta cells of islet of Langerhans while type 2 is associated with insulin resistance. According to the national diabetes registry in 2020, more than 1.6 million individuals in Malaysia have been reported to have diabetes mellitus and are suffering from its resulting complications and comorbidities such as hypertension, ischemic heart disease, cerebrovascular disease, diabetic nephropathy, retinopathy, and especially diabetic foot ulcer, which is associated with delayed wound healing [1, 2]. Diabetic foot ulcer has shown to be an optimal place for bacterial colonization which can result in gangrene and hence risk of amputation [1]. Therefore, thorough and intensive management of the wound is essential to prevent such disability.

However, due to the inadequacy and limitations of conventional treatment in enhancing wound healing, a more efficient and effective method in managing diabetic wound is crucial. With the emergence of nanotechnology, nanoparticles and nanofibers are now available to be used in such clinical scenarios [3]. Among them, one of the most notable agents is silver nanoparticles which have antimicrobial and anti-inflammatory effects, has shown promising results [4].

Aim

Our research aims to explore the use of nanomedicine for diabetic wound therapy by harnessing the antimicrobial, anti-inflammatory,

and antioxidant properties of various types of nanoparticles [4]. Our focus includes inorganic, biopolymer, and lipid nanoparticles [3]. Additionally, we seek to discover the potential benefits of nanomedicine compared to conventional methods in accelerating the healing of diabetic ulcers [5]. Moreover, we aim to uncover the potential of nanoparticles in drug delivery systems for treating diabetic wounds and reducing the healing duration.

Methodology

This study is a mini systematic review based on the analysis of secondary data, specifically systematic review articles published by various academic publishers. A total of 90 comprehensive review articles published between 2018 and 2023 were identified using search engines and databases including PubMed, ScienceDirect, Google Scholar, and ResearchGate. The search strategy employed specific keywords: nanotechnology, nanoparticles, diabetes mellitus, and wound healing. Articles were screened according to predefined inclusion and exclusion criteria. Inclusion criteria were: (1) publication between 2018 and 2023, (2) systematic review format, and (3) relevance to the specified keywords and research scope. Exclusion criteria included: (1) publication prior to 2018 and (2) articles that were not systematic reviews. The decision to focus on literature from the past five years was made to ensure the review reflects the most current advancements and evidence in the field. This time frame also allowed for a manageable number of articles to be reviewed, which was necessary given time constraints.

To minimize bias, each selected article was read and assessed independently by all members of the research team. At the time of writing, this review has not undergone external peer evaluation, and

therefore, the methodological quality of the study has not been appraised independently.

Results and Discussion

Classifications of nanoparticles

Nanoparticles can be classified into three categories based on their nature and compositions namely inorganic, biopolymer and lipid nanoparticles [3]. Metal nanoparticles such as gold, silver and zinc are considered inorganic nanoparticles and they are well known for their catalytic activity and excellent antimicrobial characteristics which are effective in treating wound healing [3,6]. For instance, silver nanoparticles act by destroying bacterial cell walls followed by the lysis of the bacteria [4,5,7]. Besides, AgNPs can reduce mRNA expression of metalloproteinases 2 and 9 in granulation tissues of the wound [4]. Gold nanoparticles on the other hand can inhibit lipid peroxidation by reducing ROS production by overactive human immune cells and bacterial cells [5,8]. Another excellent inorganic nanoparticle for diabetic wound healing is copper nanoparticles as they help in endothelial cell proliferation and angiogenesis [8]. Biopolymers can be divided into synthetic and natural. Chitosan and alginate are examples of natural biopolymer nanoparticles [1]. Their excellent mucoadhesive properties made them perfect nanocarriers in drug delivery [1]. Last but not least, lipid nanoparticles can be subdivided into liposomes, solid lipid nanoparticles and exosomes [3]. Liposomes are excellent choice for drug delivery due to their lipid bilayers structure which enable them to encapsulate hydrophilic drugs within their aqueous core and hydrophobic drugs within the lipid bilayers [9]. Liposome can also stay longer within tissue which helps in diabetic wound healing as diabetic wound healing is normally due to poor blood supply [9]. Solid lipid nanoparticles offer improved stability over liposomes and can carry a higher payload of drugs, making them suitable for sustained and prolonged delivery of antidiabetic drugs [6,8,10]. In addition, exosome promotes recovery in some vital cells such as endothelial cells, fibroblasts and keratinocytes which is important in diabetic wound healing [6, 8]. It also promotes cell-to-cell molecular communication which occurs through nucleic acids, facilitating intercellular signaling [6]. Infrequently, this signaling is mediated by cytokines, growth factors, or other bioactive substances that regulate the biological functions of the recipient cells [6,10].

Mechanism and benefits

In the realm of medical innovation, nanoparticles have emerged as powerful agents that are revolutionizing healthcare. Despite their minuscule

size, these tiny wonders hold immense potential to overcome biological barriers and deliver targeted treatments. Among them, biopolymer nanoparticles stand out as nature's safe and efficient carriers, boasting biodegradability, non-allergenicity, and low toxicity, making them highly suitable for advanced drug delivery systems. Their unique properties, such as mucoadhesive abilities, cellular binding capabilities, and wound-healing effects, represent significant advancements in medical science. Similarly, synthetic nanoparticles play a crucial role in controlled drug release, with liposomes being a prime example of personalized nanoscale drugs that, when combined with polyethylene glycol (PEG), extend drug efficacy [11,12,13].

On the other hand, the potential of metal nanoparticles like silver, gold and zinc should not be underestimated as they possess great antimicrobial activity, effectively destroying bacterial cell walls by increasing reactive oxygen species (ROS), thus promoting diabetic wound healing. Moreover, silver nanoparticles can also reduce scarring through the regulation of transforming growth factor-beta (TGF- β). Gold nanoparticles, on the other hand, show promising anti-inflammatory properties in diabetic wound healing as they can reduce the expression of AGEs production. Additionally, zinc nanoparticles showcase robust antimicrobial capabilities and significantly contribute to clot formation, inflammation resolution, cellular proliferation, and extracellular matrix remodelling [12].

Conclusion

Diabetic wounds have a longer duration of healing process and have a higher chance of getting infected [14]. Early detection and treatment of diabetic wounds will provide a better outcome [15]. The nanomedicine-based method can increase the effectiveness of targeting ability, drug efficacy, reduce the dose of drug administered, and minimize risk of side effects, and toxicity of the drugs compared to conventional diabetic wound healing methods, which are less accurate, more time-consuming and less effective [15]. Overall, this review provides an insight into the antioxidant, antibacterial and anti-inflammatory properties as well as promoting angiogenesis, advantages and application of each nanoparticle in diabetic wound management [15]. On the other hand, there are still many aspects to be improved for nanomedicine in diabetic wound healing [14]. In a nutshell, more studies and research development must be carried out in future to find solutions which lead to a desirable design and biologically safe nanomaterials which can benefit society [14].

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VIRTUAL SCREENING OF PHYTOCONSTITUENTS OF *TINOSPORA CORDIFOLIA* FOR THEIR ROLE AGAINST TNF α IN INFLAMMATION: AN *IN SILICO* STUDY

EXTENDED ABSTRACT 14

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Keywords: tetrahydropalmatine, jatrorrhizine, tinocordifolioside, tembetarine

Introduction

Inflammation is a beneficial immune body response towards foreign invaders such as pathogens, damaged cells, toxic compounds, or irradiation that works by removing harmful stimuli and initiating the healing process. Depending upon the defence capacity of the host and duration of response, it is classified as acute and chronic inflammation. Some of the inflammatory diseases include allergies, asthma, autoimmune diseases, rheumatoid arthritis, etc. Tumour necrosis factor alpha (TNF- α) is a crucial cytokine that is released by macrophages, and it has pleiotropic effects on a variety of cell types [1]. It has been identified as a major regulatory inflammatory response that is known to play a role in the pathogenesis of inflammation by inducing the production of interleukin-1 (IL-1) and interleukin-6 (IL-6) [2]. Further, TNF- α is one of the most potent physiological inducers of the nuclear transcription factor of NF- κ B [3]. Numerous studies have supported the hypothesis that NF- κ B activation that occurs in the cytoplasm in response to inflammatory stimuli arising at the cell surface constitutes a critical pathway that helps to aid in the proinflammatory genes of the nucleus [4].

The plant *Tinospora cordifolia* (TC) is also known as 'Guduchi' or heart-leaved moonseed, a member of the Menispermaceae family. It is a common climbing shrub that grows on other trees and its root, stems, and leaves are used in Ayurvedic medicine (India's traditional health care systems) [5]. This plant played a major importance in traditional Ayurvedic medicine for ages helping in the treatment of fever, jaundice, chronic diarrhea, cancer, dysentery, bone fracture, pain, skin disease,

inflammation, insect poisoning, snake bite, and eye disorders [6]. Various attributes of *T. cordifolia*, as documented in ancient Ayurvedic texts such as Rasayana, Sangrahi, Balya, Agnideepana, Tridoshshamaka, Dahnashaka, Mehnashaka, Kasa-swasaahara, Pandunashaka, Kamla-Kushta-Vataraktanashaka, Jwarhara, Krimihara, Prameha, Arshnashaka, and Kricch-Hridroganashak, are being substantiated by modern research utilizing a "reverse pharmacological" approach. Contemporary scientific studies have revealed potential medicinal properties, including anti-diabetic, antipyretic, antispasmodic, anti-inflammatory, anti-arthritic, antioxidant, anti-allergic, anti-stress, anti-leprotic, antimalarial, hepato-protective, immunomodulatory, and anti-neoplastic activities associated with *T. cordifolia*. This comprehensive review consolidates the various properties and medicinal uses of *T. cordifolia* as described in Ayurvedic texts, alongside reports on its phytochemical composition and pharmacological effects [7]. The dried stem of TC produced a significant anti-inflammatory effect in both acute and subacute models of inflammation. TC was found to be more effective than acetylsalicylic acid in acute inflammation [8]. CETC inhibited the LPS-induced upregulation of cyclooxygenase-2 (COX-2) without inhibiting the COX-1 gene. CETC, ethanol extract, hexane extract, and water extract were mainly used in experimentation and CETC exhibited selective COX-2 inhibition properties. Also noted that CETC effectively prevented the LPS-signalled activation of NF- κ B and p38 [9]. With the above findings from the literature, it is understood that TC has significant anti-inflammatory potential although, the mechanism of action of it is not yet clearly understood. As the TNF- α and NF- κ B are the

important precursors for producing various inflammatory and chemical mediators during inflammation, the proposed study is aimed to explore the possible mechanisms of phytoconstituents of TC for their anti-inflammatory action through computational screening targeting TNF- α and NF- κ B.

Methods

This study uses the 3D structure of the human TNF α that was retrieved from the protein databases. A library of phytoconstituents of *T. Cordifolia* is created and listed them by literature survey. A total of 31 phytoconstituents structures were collected from several literatures. The 2D molecular structures of all 31 phytoconstituents from *T. Cordifolia* were drawn using ChemSketch and converted into a compatible mode for molecular docking with the protein structure. For molecular docking, the AutoDock 4.2.6, Vina and Cygwin terminals were employed. The visualization and the interaction analysis of the docked complexes were performed using Discovery Studio and PyMol. The ligands which showed interactions with the active sites of the target protein were shortlisted and displayed in the results. Their energetic profile and interacting residues were documented. Further, the bioactivity and drug-likeness scores were also derived using SwissADME and ADME servers. The LD₅₀ prediction scores were tabulated using ProTox II web server.

Results

A total of 12 compounds exhibited binding abilities with TNF- α out of 31 phytoconstituents. The binding energies ranged from -11.1 to -6.9 kcal/mol. The 12 shortlisted ligands showed multiple interactions of both hydrogen and hydrophobic types with the TNF- α and the top four compounds that have showed maximum number of interactions and binding energies include tetrahydropalmatine, jatrorrhizine, tembetarine, tinocordifolioside. The selected four ligands have fulfilled the criteria for Lipinski's rule of five. Their LD₅₀ values ranged from 200 mg/kg to 2050 mg/kg body weight.

Table 1. Top four phytoconstituents of *T. cardifolia* and their interactions with residues of TNF- α (PDB ID: 2AZ5).

Phytoconstituents	Binding energy (kcal/mol)	No. of interactions	Hydrogen bonds	Hydrophobic bonds
Tetrahydropalmatine	-8.3	10	Tyr 151 Ser 60 Leu 120	Tyr 59 (5) Leu 57 Ile 155

Jatrorrhizine	-10.1	10	Tyr 151, Ser 60 Leu 120	Tyr 59 (5) Leu 57 Ile 155
Tembetarine	-10.1	7	Tyr 151	Tyr 59 (5) Leu 120
Tinocordifolioside	-9.05	9	Leu 120 (2) Tyr 151, Gly 121 Ser 60	Tyr 59 (3) Leu 57

Discussion

A total of 12 constituents exhibited interactions and binding ability with TNF- α protein structures. These compounds were predicted to have potent inhibitory activity evidenced by their interactions that are matched with the interacting residues of native ligand in respective protein crystal structure. Residue Leu57 was found to be crucial for TNF- α inhibition as it formed multiple interactions with native ligand. Out of 12 compounds 8 have shown feasible drug-likeness scores which means that they are suitable to become drug candidates. All shortlisted compounds were found to be less toxic as per their predicted LD₅₀ values.

Conclusion

This study disclosed the excellent binding affinity of shortlisted compounds of *T. cordifolia* with active sites of TNF- α and NF κ B. They could play a major role in interrupting the pathogenesis of various inflammatory conditions. Further studies are required to evaluate their efficacy *in vivo* and on inflammatory pathways.

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NANOMEDICINE IN THE MANAGEMENT OF DIABETIC NEPHROPATHY: A MINI REVIEW

EXTENDED ABSTRACT 15

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Keywords: atherosclerosis, cardiovascular disease, endothelial dysfunction, endothelium, medicinal plants

Introduction

Diabetic nephropathy (DN), a progressive deterioration in kidney structure and function leading to chronic kidney disease or end-stage renal disease, is one of the most common and severe microvascular complications of diabetes mellitus (DM) [1]. Pharmacological treatment of DN aims at controlling hyperglycaemia, hypertension and dyslipidaemia. However, these treatments often fail to halt the disease progression. Nanomedicine offers a novel therapeutic strategy, leveraging nanoparticles (NPs) for targeted drug delivery and minimizing side effects in DN [2]. They behave as drug carriers, protecting the drug from the microenvironmental conditions at the administration site, transporting their drug cargo to target body compartments, and releasing the drug at the target site under environmental stimuli [3]. This review explores the potential benefits and challenges of using nanomedicine for managing DN, supported by current research findings and proposed future directions.

Methods

This study is a brief narrative review based on data gathered from online databases such as Scopus, ScienceDirect, Google Scholar, and PubMed, covering research conducted in the last three years (2022–2024). A combination of the keywords, which are "Nanomedicine" OR "Nanoparticle" AND "Diabetic nephropathy", was used. The inclusion criteria are pivotal studies published between 2022 and 2024, while studies conducted before 2022 or after 2024 and studies without full-length articles were excluded.

Results and Discussion

DN is a chronic complication that may be attributed to poor glycemic control, long duration of DM and having a first-degree relative who also has DN. Screening for DN is usually done by determining the presence of albumin in urine in two out of three morning urine collections over six months, which indicates albuminuria [4]. DN pathogenesis involves complex interactions of oxidative stress, inflammation, and fibrosis within the renal tissue [5]. Hyperglycemia induces oxidative stress, leading to the formation of advanced glycation end products (AGEs). AGEs play a significant role in promoting renal inflammation and fibrosis [6]. Previous studies have shown that oxidative stress leads to direct and indirect damage to the renal interstitium due to renal vascular sclerosis, increased vascular permeability and activation of downstream mediators in the case of long-term hyperglycemia conditions [7]. Upregulation of inflammatory cytokines further contributes to renal tissue scarring and loss of function [8]. Various pathogeneses involved in the development of DN are illustrated in Figure 1.

Nanotechnology refers to the use, or application, of engineered macromolecules in the size range of 1–100 nanometers [9]. Nanomedicine involves the use of nanotechnology in medical applications, particularly in drug delivery [7]. Nanomedicines and NPs have lately surfaced as effective diagnostic, imaging, and therapeutic agents for various diseases and disorders, including DN [7]. NPs are designed to target specific tissues, including the kidneys, using surface modifications. This allows precise drug delivery to damaged renal tissues,

enhancing therapeutic outcomes and decreasing the adverse effects of drugs. Various types of NPs have been explored for targeted approaches to treat DN (Figure 2) [10, 11].

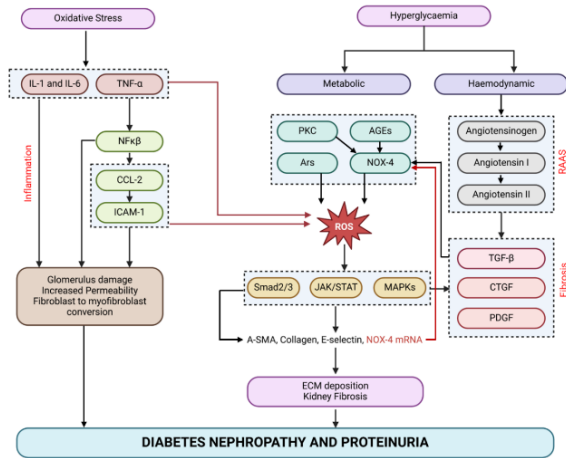


Figure 1. The pathogenesis of DN involves fibrosis, inflammation, and oxidative stress. Figure modified from Lin et al 2022 [7]. AGEs: Advanced glycation end-products; α -SMA: α -smooth muscle actin; CCL2: Chemokine (C-C motif) ligand 2; CTGF: Connective tissue growth factor; ECM: Extracellular matrix; ERK: Extracellular regulated protein kinases; ICAM-1: Intercellular cell adhesion molecule-1; IL-1, 6: Interleukin-1,6; JAK/STAT: Janus kinase-signal transducer and activator of transcription; JNK: c-Jun N-terminal kinase; MAPKs: Mitogen-activated protein kinases; NF-KB: Nuclear factor KB; NOX-4: Nicotinamide adenine dinucleotide phosphate oxidase-4; PDGF: Platelet-derived growth factor; PKC: Protein kinase C; RAAS: Renin-angiotensin-aldosterone system; Smad2/3: Drosophila mothers against decapentaplegic protein 2/3; TGF- β : Transforming growth factor- β ; TNF- α : Tumor necrosis factor α .

Polymeric NPs have shown increased significance in drug delivery due to biocompatibility, which allows for more effective and controlled delivery. Poly(lactic-co-glycolic acid) (PLGA) NPs, for example, have been used to deliver anti-inflammatory agents directly to the kidneys, reducing inflammation and oxidative stress [4, 12]. Lipid-based NPs have been reported to possess good biodegradability, biocompatibility, higher kidney retention, and minimal immunogenicity [1]. Liposomes are vesicles composed of lipid bilayers, ideal for carrying hydrophilic and hydrophobic drugs. Liposomes loaded with antioxidants or ACE inhibitors have shown promise in preclinical models of DN, improving renal function [4]. Liposomes have been reported to have lower affinity to the kidney, which reduces the severity of drug-induced nephrotoxicity [7]. Metal-based NPs such as gold,

zinc and selenium NPs have demonstrated protective effects in DN models by reducing oxidative stress, inflammation, and fibrosis by delivering anti-inflammatory drugs and scavenging ROS [13, 14]. Different types of NPs used in the management of DN are illustrated in Figure 2.

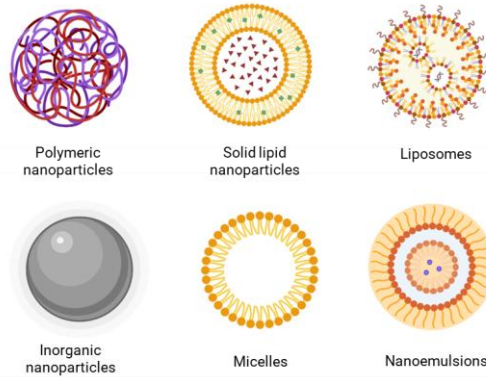


Figure 2. Different types of NPs used in the management of DN.

Several preclinical studies have highlighted the promising potential of nanomedicine for treating DN. These NPs help mitigate oxidative stress, inflammation, and fibrosis while enhancing renal function, making them a promising therapeutic strategy for DN.

Preclinical studies have shown promising outcomes; however, several challenges need to be addressed before nanomedicine can be translated from bench to bedside. Achieving efficient renal targeting with minimal or without nephrotoxicity remains a major challenge due to the complex structure of the kidneys, especially the glomerular filtration barrier [7, 15]. Other than that, the biocompatibility and toxicity are also a concern, as the chronic use of NPs in diabetic patients could pose a risk of NP buildup in the kidney, which can lead to renal damage [7, 16]. Future research in nanomedicine for DN treatment must overcome several key challenges to ensure the successful transition from preclinical models to clinical trials. Key areas for further investigation include the NPs' physicochemical characteristics optimization to improve renal targeting ability while minimizing toxicity [7, 17]. This can be achieved by modifying the size, surface charge, and functionalization of NPs, which are the key factors that determine specificity and clearance [1, 3]. Furthermore, the development of biodegradable NPs that can be safely cleared from the body will address long-term toxicity concerns [16]. Finally, transitioning from preclinical research

to clinical trials is critical to validate the therapeutic potential of NPs in DN treatment. Large-scale, controlled trials are essential to validate the therapeutic potential of NPs in DN treatment [12].

Conclusion

Nanomedicine holds significant promise for advancing the management of DN by improving drug targeting, enhancing bioavailability, and reducing systemic toxicity. While preclinical studies have demonstrated the efficacy of nanoparticle-based therapies, several challenges remain before these treatments can be applied in clinical settings [17]. Ongoing research focused on nanoparticle optimization, safety evaluation, and translational studies will be crucial in realizing the full potential of nanomedicine for DN [18].

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PREVALENCE OF FLAT FOOT ANOMALIES AMONG UNDERGRADUATE STUDENTS FROM DIFFERENT ETHNIC POPULATIONS

EXTENDED ABSTRACT 16

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Introduction

The foot is a complex joint which fundamentally functions as a weight bearer and shock absorber for the human body, enabling and supporting our functional ability to stand, walk and run. This is in part thanks to the complex anatomy of the foot, especially the foot arches. The three arches of the foot function as a base of support, a force absorber, as well as a rigid lever during gait propulsion. The medial longitudinal arch (MLA), which is the highest of all arches, consists of the anterior and posterior pillars, which are supported by the plantar aponeurosis, spring ligament, deltoid ligament, tibialis anterior and posterior muscles and flexor hallucis longus muscle. The lateral longitudinal arch (LLA), which is the lowest arch, is supported by plantar aponeurosis, long and short plantar ligaments and the peroneus longus tendon. The transverse arch, which runs from medial to lateral in the midtarsal and tarsometatarsal areas, is non-weight bearing [1].

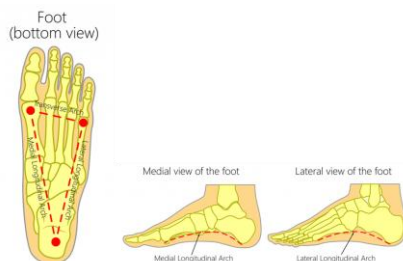


Figure 1: Anatomical representation of foot arches in medial, lateral and inferior views, Image adopted from Atik, 2013 [2].

Pes planus, commonly referred to as ‘flat foot’, presents when the longitudinal and/or medial arches of the foot collapse and the entire foot sole comes into complete or near-complete contact with the ground during all weight-bearing activities [2]. This phenomenon can occur due to many reasons, such as injury or illness, wear and tear, genetic factors, faulty biomechanics, or prolonged stress on the foot caused by excessive body mass, however, the main reason is thought to be due to the laxity of ligaments of the foot. Pes planus was divided by Staheli into 2 groups which are physiological (flexible) and pathological (rigid) flatfoot [3,4]. A flexible flat foot has an arch that is present in an open kinetic chain (non-weight bearing) and lost in a closed kinetic chain (weight bearing), while a rigid flat foot has loss of the longitudinal arches in open and closed kinetic chains [5]. To put it simply, in a flexible flat foot, the foot arch is restored once one’s body is raised on tiptoe (tiptoe test); a rigid flat foot will remain flat. Jack’s test (great toe dorsiflexion as plantar fascia tightens) may be used to differentiate between these two conditions easily [5].

Flexible flat feet are the most common type of flat foot, and they seldom cause issues, while rigid flat feet can cause severe pain and disability. As Wenger et al. described, “flexible flatfoot is an unavoidable outcome of trying to walk on normal foot bones with loose ligaments” [6]. It typically begins in childhood or adolescence and continues into adulthood [6].

According to the latest data collected by the Global Health Observatory (GHO) by the World Health Organization (WHO) in 2022, Malaysia was found to have the highest prevalence of obesity

among adults (both age-standardized estimate and crude estimate) in Southeast Asia [7, 8]. Another national cross-sectional survey conducted by the National Health Statistics of Malaysia (NHMS) in 2019 revealed that 50.1% of adult citizens are either overweight or obese, with 30.4% being overweight and 19.7% being obese. Trends of obesity have also continued to rise as compared to the earlier NHMS national surveys done in 2011 (29.4% overweight, 15.1% obese) and 2015 (30.0% overweight, 17.7% obese). In addition, 29.8% of total children from 5 to 17 years of age are overweight (15.0%) and obese (14.8%) [9].

Objectives

One of the most significant health issues facing the world population today is the increasing prevalence of childhood obesity, and prior studies have described a link between childhood obesity or elevated body metabolic index (BMI) with the prevalence of flat footedness [6,10,11,12]. However, there is a limited number of studies and data that have been collected based on adult demographics, hence describing the need for such research.

Methodology

This cross-sectional study examined the relationship between the prevalence of flat feet among the different ethnicities among undergraduate students of MUCM, as well as the relationship between flat feet and BMI. The data collection was conducted between early September and November 2023. Participants who are students from the Faculty of Medicine in MUCM were recruited using convenience sampling, targeting a sample size of 150. Students who did not fit the inclusion criteria above, as well as had any history of surgery, major trauma or fractures at the level of the ankle and foot, were excluded. In addition, students who had congenital flat foot anomalies or any neuro-muscular involvement of the ankle and foot were also excluded.

Demographic data was first collected from willing participants via an online questionnaire in English, shared among the students through various social media platforms including WhatsApp, Instagram and email. The data collected via this method included age, gender, ethnicity, height and weight as well as contact information. Data on age and gender were classified into 3 strata: the first being ages 15 to 19 (male and female), the second being ages 20 to 24 (male and female), and the third being ages 25 to 24 (male and female). Height and weight were collected for BMI calculation purposes and were classified according to WHO BMI ranges

(<18.5 underweight, 18.5-24.9 normal, 25.0-29.9 overweight, >30.0 obesity).

Using the contact information collected, another meeting was scheduled in person where foot anthropometry data was collected by using a pedograph method. This was done by asking participants to dip both feet into a tray containing ink and then proceed to stand on a sheet of white paper. The resulting imprinted footprints were described based on the Denis method of flat foot assessment (Figure 2). Ethical approval was obtained from the institution’s research ethics committee to conduct this research (Reference Number: MUCM/REC –80/2022). Analysis was conducted using OpenEpi (Version 7.6.2.0), with results presented through descriptive and inferential statistics via correlation and strength of association based on Odds Ratio. The significance level (p-value) was set at 0.05, with a 95% confidence interval.



Figure 3. The Denis method of flatfoot assessment. Figure adopted from Pourghasem et. al. [10].

Results and Discussion

Table 1 tabulates our survey population's demographic characteristics, which consisted of 150 respondents. Our survey population consisted of more females than males, with 83 female respondents (55.3%) and 67 male respondents (44.7%). The majority of respondents were between 20 to 24 years old (51.3%) and of Indian ethnicity (55.3%). Respondents who were not of Indian or Chinese ethnicity, such as Eurasian and Kadazan, were categorized as Others, and constituted 18 respondents (12.0%).

Table 1. Demographic Characteristics of our respondents (n=150)

Demographic Characteristics	n(%)
Gender	
Male	67 (44.7%)
Female	83 (55.3%)
Age	
Freshmen (15-19yo)	54 (36.0%)
Juniors (20-24yo)	77 (51.3%)
Seniors (25-30yo)	19 (12.7%)
Ethnicity	
Indian	83 (55.3%)
Chinese	49 (32.7%)
Others	18 (12.0%)

Table 2 and 3 tabulate the calculated BMI of our participants with Denis’s method of Flat foot assessment. Out of 150 participants, 68 (45.3%)

showed a flat foot of grade Ff1 and above. When comparing the relationship between BMI and flat-footedness in our data, we found that out of 6 underweight participants, only 1 participant (16.7%) had a flat foot of grade Ff1. Of those who were of normal BMI (70 participants), there were 50 participants (41.7%) who had a flat foot of grade Ff1. Lastly, for those who were of overweight BMI (24 participants), there were 12 participants (50.0%) who had a flat foot of grade Ff1, and 5 participants (20.8%) who had a flat foot of grade Ff2. Strength of association based on Odds Ratio showed that those who were overweight BMI were 3.40 times more likely to have flat feet when compared to normal BMI. In comparison, participants who were underweight BMI were 0.28 times less likely to develop flat-foot when compared to normal BMI.

Table 2. Relationship between BMI and flat-footedness in this study.

BMI	Normal (n/%)	Ff1 (n/%)	Ff2 (n/%)	Ff3 (n/%)	n (%)
Underweight	5 (83.4%)	1 (16.7%)	-	-	6 (4%)
Normal	70 (58.3%)	50 (41.7%)	-	-	120 (80%)
Overweight	7 (29.2%)	12 (50.0%)	5 (20.8%)	-	24 (16%)

Table 3. Association between BMI and flat-footedness in this study.

BMI	Normal (n/%)	Flat foot ¹ (n/%)	OR (95%CI)	P-Value
Underweight	5 (83.4%)	1 (16.7%)	0.28 (0.03 – 2.47)	0.429
Normal	70 (58.3%)	50 (41.7%)	(reference)	
Overweight	7 (29.2%)	17 (70.8%)	3.40 (1.31 – 8.81)	0.017

¹ Flat foot includes all grades (Ff1, Ff2, Ff3) based on Denis’s method of Flat foot Assessment.

Tables 4 and 5 present the ethnic distribution of participants assessed using the Denis method for flat foot evaluation. Our analysis shows that individuals of Chinese ethnicity exhibited a higher prevalence of flat foot, with 26 participants (53.1%) affected. In contrast, 37 participants (44.5%) of Indian ethnicity and 5 participants (27.7%) from other ethnicities were found to have flat feet. Strength of association based on Odds Ratio showed that participants from Chinese ethnicities were 1.41 times more likely to develop flat-foot when compared to participants from Indian ethnicities, with a p-value of 0.446 showing statistical insignificance.

Table 4. Relationship between ethnicity and flat-footedness in this study.

Ethnicity	Normal (n/%)	Ff1 (n/%)	Ff2 (n/%)	Ff3 (n/%)	n (%)
Indian	46 (55.4%)	33 (39.6%)	4 (4.8%)	-	83 (55.3%)
Chinese	23 (46.9%)	25 (51.2%)	1 (2.0%)	-	49 (32.7%)
Others	13 (72.2%)	5 (27.7%)	-	-	18 (12.0%)

Table 5. Association between ethnicity and flat-footedness in this study.

Ethnicity	Normal (n/%)	Flat foot ¹ (n/%)	OR (95%CI)	P-Value
Indian	46 (55.4%)	37 (44.6%)	(reference)	
Chinese	23 (46.9%)	26 (53.1%)	1.41 (0.69 – 2.85)	0.446
Others	13 (72.2%)	5 (27.8%)	0.48 (0.16 – 1.46)	0.295

¹ Flat foot includes all grades (Ff1, Ff2, Ff3) based on Denis’s method of Flat foot Assessment.

Discussion

The findings of this study align with existing literature and previous studies that suggest that a higher BMI is associated with the prevalence of pes planus. Based on our results, we found that a higher percentage of flat feet were present in participants with overweight BMI (70.8%) as compared to participants with normal BMI (41.7%) or underweight BMI (16.7%). In addition, the OR of 3.40 for overweight BMI and 0.28 for underweight BMI proves there is a strong association between BMI and flat foot, however data for the latter was statistically insignificant. Furthermore, our results show that flat feet of grade Ff2 were only present in participants of overweight BMI (20.8%), which supports the theory that prolonged stress on the foot due to excessive body mass is a contributor to the development of pes planus.

Our study revealed a higher prevalence of flat feet among participants of Chinese ethnicity (53.1%) compared to those of Indian (44.5%) and Other ethnicities (27.7%). The OR of 1.41 with a p-value of 0.446 (statistically insignificant) indicates a strong association between the Chinese ethnicity and flat foot. This finding contrasts slightly with previous research, which reported lower rates of flat feet in studies conducted on African, Asian, and Nigerian populations [16].

This study provides valuable insights into the relationship between BMI, ethnicity, and pes planus in an adult population, highlighting both similarities

and differences with previous research. While its findings are strengthened by comparisons to established studies, the research faced significant limitations, including a small sample size of 150 participants and the use of convenience sampling, which limits the generalizability of the results. Additionally, reliance on self-reported BMI data through online questionnaires may have introduced response bias. The study also did not account for other factors influencing pes planus, such as active lifestyles, which could strengthen foot muscles and reduce the risk of pes planus. Informal observations suggested that dominant foot usage in sports could increase stress on one foot, potentially leading to unilateral pes planus. Further research is recommended to explore the impact of shoe-wearing habits on foot biomechanics and pes planus development.

Conclusion

Our study highlights the association between BMI and the prevalence of flat foot among undergraduate students in the Faculty of Medicine, MUCM. Our data showed a positive correlation between a higher BMI and the prevalence of flat foot, as well as an increased severity of flat foot found in association with higher BMI. These findings align with existing literature and studies, indicating a consistent relationship between BMI and flat foot. As for the relationship between ethnicities and the prevalence of flat foot, our studies showed that flat foot was more prevalent among Chinese ethnicities compared to Indian ethnicities, however, these findings clash with previous literature [12]. This underscores the need for further research to explore the relationship between ethnicity and flat foot, as well as the mechanisms underlying pes planus and its other various contributing factors.

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