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EDITORIAL

PROS AND CONS OF SMART PHONES IN HEALTH – HAS THE TIME COME TO LEGISLATE THE RATIONAL USE OF THESE DEVICES?

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Smart phones are now an important component of our daily life. Smart phones use at workplace brings in several challenges. In hospital settings and at teaching areas in medical colleges, improper usage results in many important risks like affecting teaching activities, privacy and security of patients as well as healthcare workers. More over smart phones also result in distractions, nuisance and affect many decision-based activities at critical times like in ward rounds, in meetings like case discussions and in examination of patients by students. A lot of time is wasted by use of social media applications at workplace, like Facebook, twitter and WhatsApp. Use of smart phones during working hours is a big source of wastage of time on part of healthcare providers. But at the same time doctors need these devices for patient management. Medical students and other support staff do not need these devices for any essential job during the working hours. There is a strong need to rationalize the use of smart phones during working hours

A smart phone is a mobile device with additional features, just as personal digital assistant devices. Many brands of smart phones like Apple® iPhone®, Android based devices like Samsung Galaxy S, HTC mobiles, BlackBerry devices, Microsoft Windows devices, and Nokia are being used in Pakistan. Smart phone applications (apps) are software programs that run only on a smartphones or other similar devices with or without internet connectivity. Apart from many social media sites, there are a lot of common apps related to health care, fitness, medical and lifestyle modification for many common diseases. Along with an increase in number and types of apps available across the globe, there is an increase in demand of smart phones in hospital settings. In order to make sure that excessive usage or rather abuse may not result in medical errors or inefficiency, hospitals and medical institutions have to develop some guidelines and some strict policy about usage of smartphones at workplaces.

For many years it has been well known that use of smart phones causes decline in cognitive function and performance, an increase in reaction time, decreased concentration and low performance in a task which need to have a quick decision or solution[1]. Use of smart phones also result in a decrease in attentiveness along with un-intentional blindness. Smartphone users are sometimes so engaged in their activity on phone that even looking around doesn't register anything or register it appropriately. It has been practically demonstrated that one is unable to handle excessive amount of information at any given time due to use of cell phones, which causes distraction from the primary task. Even using smart phones during walking can be dangerous, leading to slowing down inappropriately, incorrect changes of directions and lack of awareness about passing-by colleagues. Halamka recorded a case where a trainee in medicine forgot to stop an anticoagulation drug of an operated patient due to distraction caused by a text message received on her cell phone[2]. A study from Australia observed that with each interruption in a medical care facility there was a 12.1% increase in failure of procedures and 12.7% increase in medical errors[3]. Some of negative outcomes of cellular phones also resulted in discordance in working between doctors and nurses due to an over reliance on text messages and little verbal communication[4]. Rosenfield et al demonstrated that cellular phones can result in facilitation in learning, treatment, and communication by taking interesting diagnostic pictures, recording videos of procedures, but again it is disruptive and distracting[5]. Rosenfield admitted in his study that cellular phones resulted in a compromise in patients'

privacy, confidentiality and their data security. It can be a risk to infection control and cross-contamination[6]. In some studies; it has been shown that electromagnetic radiation by smartphones result in malfunction of some patients' devices like a pacemaker or of some other medical equipment[7].

A complete ban on smartphones at workplace is not a good option as it can result in in-attention, social detachment and an intentional non-adherence with work of this gadgets addicted generation. A policy on smartphone usage at hospitals or other health care related setting which can address the issues can help to alleviate the anticipated future risks. Health care organizations must take actions to limit unauthorized or unlawful cell phones to access their network and information. Personal message or any kind of interruption via smartphone must be avoided. Each health care facility must analyze the need of their employees about phone usage and modes of required communications and to set some necessary guidelines.

In conclusion, from all of the above discussion and in reference to above studies, it is evident that smartphones and other such devices, although form an integral part of our today's life, are compromising data security, privacy of patients, effecting patient quality care, efficiency of healthcare professionals and are a continuous sources of distraction. There must be some restrictions on use of smart phones in teaching areas of medical colleges and in hospital settings and there is need of developing guidelines and awareness about this scorching issue.

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EDITORIAL

AFLATOXINS - A THREAT NOT SO OBVIOUS

Aflatoxins are biological poisons produced by fungi present on crops, in fresh or dried fruits and spices. *Aspergillus flavus* and *Aspergillus parasiticus*, are two main producers of aflatoxins. These fungi are abundant in warm and humid regions of the world. The discovery of these fungal toxins was a result of research carried out in United Kingdom to investigate sudden death of 100,000 turkeys in 1960. Since then these toxins have been recognized as ubiquitous contaminants of food stuff, particularly in many developing countries.[1]

Several metabolites (mycotoxins) of many other fungi have toxic properties. Because of abundance and toxicity 4 types of these toxins, namely Aflatoxin B1 and B2 (AFB1, AFB2), and Aflatoxin G1 and G2 (AFG1, AFG2) are more important. AFB1 is the most toxic and a potent carcinogen. Among the risk factors of cancer after age, alcohol and diet, comes the carcinogens (cancer causing substances). International agency for research on cancer has classified aflatoxins in group I i.e. a substance known to be definitely carcinogenic.[2]

Being in the temperate region, Pakistan has hot and humid climate which favors growth of fungi on crops as well as harvested food grains and other edibles. Food storage conditions are far from satisfactory. Considering all this, the importance of food contamination with aflatoxins and consequent effects on health cannot be overemphasized. Besides their effect on the liver, aflatoxins also affect child growth, reproductive health and immune system. Role of aflatoxins on national health is to be highlighted in the proceeding paragraphs.

Aspergillus species frequently affect cereals (corn, wheat, rice), oilseeds (cotton seed, soybean, sunflower and peanut), spices (black pepper, chili pepper, turmeric, ginger, coriander) and tree nuts (coconut, walnut, almond, and pistachio). Contamination occurs both pre and post harvest. Human exposure occurs by eating foods contaminated with these toxins. A metabolite of aflatoxin (AFM1) accumulates in the milk and meat of animals being fed on fodder and feed prepared with ingredients contaminated with the fungus. Consumption of such contaminated milk and meat is another source of human exposure to aflatoxins. A recent study reported that more than 70% of 974 samples of milk from Punjab were found to contain > 0.5µg/L aflatoxin M1 (AFM1).[3]

These fungi grow on plants and their toxins penetrate the crops, fruits and nuts. Aflatoxins are sparingly soluble in water. Washing contaminated edibles cannot be relied upon for removing these toxins. Melting point of different aflatoxins is well above 200°C. Therefore temperatures attained during cooking procedures (boiling, frying, and baking) do not completely inactivate affaltoxins.[4]

Prolonged exposure to even small amounts of aflatoxins is dangerous because being sparingly water soluble, these toxins are not excreted and accumulate in the liver. Microsomal enzymes of cytochrome P450 are involved in the metabolism of these toxins in humans. These enzymes convert aflatoxins to a reactive oxygen species (aflatoxin-8, 9-epoxide). This molecule binds to proteins and causes acute poisoning (aflatoxicosis). It also binds to DNA and induces liver cancer.

Studies from different countries have established a direct link between presence of aflatoxins in food and primary liver cancer. Chronic infection with hepatitis B and C viruses and aflatoxins are classified as class I carcinogens.[5] National surveys in recent years describe the prevalence of Hepatitis B and C as 2.8% and 4.3% respectively.[6] Number of liver cancer cases in Pakistan is constantly on the rise.[7] Most of this liver cancer is a result of Hepatitis B, C or D related cirrhosis. Nevertheless, Hepatitis B and C negative cases of liver cancer are not uncommon either.

Diagnosis of cancer, particularly liver cancer is made very late, at least in Pakistan. Therapeutic options are limited, expensive and not easily available to population in general. According to a report issued by Pakistan bureau of Statistics, total per capita expenditure on health in the year 2015-16 was $45 (Rs.4688 approx.). This includes expenditure by the federal and provincial governments; and the private sector. In 2018, Pakistan government spent <1 % of GDP on health.

There is high prevalence rate of hepatitis B, C and tuberculosis. Infections with HIV are increasing[8] and food safety mechanisms are almost non-existent.

Considering these facts and keeping in view inadequate health care facilities in the country and poor prognosis of liver cancer, one sees a gloomy picture of national health in coming decades.

Introduction of modern scientific methods in agriculture, provision of properly designed, purpose built storage sites for wheat, corn, rice and other edibles; and scientific management of these sites will reduce the contamination of these food staples with Aspergilus and other fungi.

For food industry, introduction of a law for mandatory statement of "Aflatoxin Free" or "Aflatoxin Tested" on all packaged products (chicken, dairy, meat, food grains, spices etc) will also be a good measure for reducing the risk. Increasing awareness of masses about dangers of consuming unsafe and unhygienic food is also very important. Besides other means, using electronic media for the purpose may have very good results.

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RESEARCH ARTICLE

PERCEPTIONS OF FIRST YEAR MEDICAL STUDENTS TOWARDS MEDICAL EDUCATION AND MEDICAL PROFESSION

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ABSTRACT

Objective: *To determine the first year medical students about the reasons of joining medical education, effective tools to enhance their learning and their future specialization interests.*

Design: *Descriptive cross sectional study*

Place and duration of study: *Two private medical colleges of Islamabad, Pakistan from 1st March 2014 to 31st March 2014.*

Materials and methods: *All the first year medical students of both private medical colleges were included. A questionnaire proforma included questions regarding demographic profile, reason of choosing medical profession, expected type and medium of teaching, co-education versus non-co-education, financial support for studies and career choices. Descriptive statistics and chi square test was used to determine the strength of relationship between different variables.*

Results: *A total of 180 first year medical students participated in the study. The mean age of the participants was 19.2 (+- SD 1.12). Gender distribution was comparable in both medical colleges (54% males versus 46% females). Majority of the participants joined medical profession due to their passion (56.7%) and agreed that getting respect is the main reason of joining this field, 73.3% participants were in favour of co-education. Effective tools of learning were combination of lectures, practicals and small group discussions (SGD). Majority intended to do specialization in future and amongst them, Surgery (51.7%), Obstetrics/Gynaecology (16.1%), Medicine (10%), Paediatrics (8.3%), Radiology (0.6%) and others like Anesthesia/Pathology/Basic sciences (9.3%)) were their preferred fields of interest.*

Conclusion: *Passion of medical profession and getting respect is still the main reason of joining medical profession. The traditional fields of medicine are still preferred by majority of the students.*

Keywords:

perceptions, students, medical profession

INTRODUCTION

Medical profession is considered to be one of the most popular profession of majority of the bright students of Pakistan who pass their intermediate examination with high grades. Unfortunately there is a very limited number of government medical colleges leading to the shortage of doctors in the country. In the recent years, there has been a rising trend of private medical colleges in Pakistan approved by the Pakistan Medical Commission (PMC) to overcome the shortage of doctors in the country.[1] These private medical colleges are expensive and faculty members are trying their best to deliver the knowledge that is based on new teaching practices like Problem-based learning (PBL) and interactive sessions to enhance the academic competencies of the students.

Choice of a career is a difficult decision for the students which not only involves self awareness of the interests and certain personality characteristics but is also influenced by extrinsic factors like family influence, role modeling and peer tutoring.[2] The choice of specialty by the students directly affects the distribution of health care personnel in different fields.[3] For the choice of ideal specialty, it requires proper guidance regarding the scarcity and saturation of the healthcare personnel in that field.[4]

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Previously medical education was driven in the form of traditional teacher centered lectures which is now shifted to problem based learning and small group discussions. These interactive sessions strengthen interpersonal skills and enhance problem solving capacity of the students.[5]

Becoming a doctor in a private medical college not only requires a lot of dedication and hard work but financial implication too. Staying up-to-date with the latest technology while sacrificing the family time is difficult. So this study was conducted, to determine the students' perspective for joining medical education, effective tools to enhance the learning and the future specialization interests among first year medical students.

MATERIALS AND METHODS:

After taking ethical approval from the institutional ethical committee, this descriptive cross sectional study was conducted in two private medical colleges of Islamabad, Pakistan from 1st March 2014 to 31st March 2014. A total of 180 first year medical students participated in the study. To develop the questionnaire proforma, we performed consensus meetings with all the authors of the study. After extensive literature search on attitudes of the medical students towards their career, a validated questionnaire was designed.[2-5] After explaining objectives of the study, first year medical students of both private medical colleges who were willing to participate in the study were included. Students who were unwilling to participate or those who had filled incomplete proformas were excluded from the study. A questionnaire proforma included questions regarding demographic profile (age, gender, marital status and highest qualification), reason of choosing medical profession, expected type and medium of teaching, co-education versus single gender education, financial support for studies and career choices. Statistical package for social sciences (SPSS) version 21 was used for statistical analysis. Descriptive statistics and chi square test was used to determine the strength of relationship between different variables. P value <0.05 was considered statistically significant.

RESULTS:

A total of 180 first year medical students participated in the study, 85 (47.3%) from one private medical college and 95 (52.7%) from the other. The mean age of the participants was 19.2 (+-SD 1.12). Gender distribution was comparable in both medical colleges. Majority of the participants were single and maximum had done intermediate examination [table I]

Table I: Demographic profile of the participants

Variables		Number (n)	Percentage (%)
Gender	Males	97	54
	Females	83	46
Marital status	Married	4	2.2
	Single	176	97.8
Type of education	Intermediate	164	91.1
	A levels	11	6.1
	Other	5	2.8

Majority of the participants joined medical profession due to their passion (56.7%) while others joined due to parents wishes (18.9%), just by the way (3.9%), and other reasons which they did not specify (20.5%). Males joined this profession more because of parents wish ($p<0.01$).

Finances for the students were managed by their fathers in majority of the cases (83.3%) whereas mother, grandparents, brothers and guardians contributed to the rest of them.

Regarding choice of private or public sector, many participants wanted to join public medical colleges and the most stated reason being better fee structure in public sector as shown in Fig 1. There were no gender differences about the choice of private or public sector medical colleges ($p>0.05$).

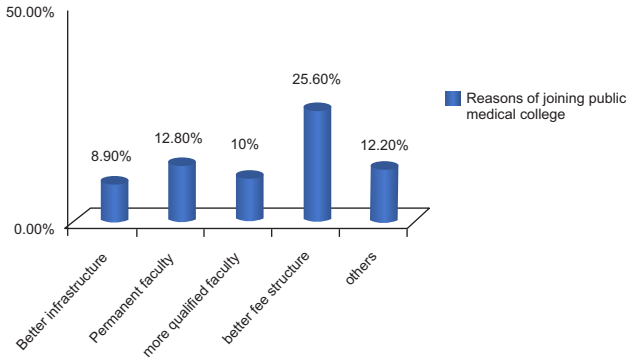

Fig 1: Reasons of joining public sector medical college

More than 70% of the participants agreed that being respected is the main reason of joining this field while others stated financial reward and self employment as the other reasons.

Majority of the participants were in favour of co-education (73.3%) because co-education builds up self

confidence and that medical field can never be gender-biased whereas those in favour of separate education system for both sexes were due to religious beliefs only and this opinion was shared by both sexes (p>0.05)

Most participants were expecting a mixture of self study and spoon feeding by the teachers (77.8%), whereas 14.4% were expecting self-study and only 7.8% were expecting spoon feeding by the teachers. No gender differences were noted in view of this type of teaching (p>0.05). When asked about the options of preferred and effective tools of learning, majority were in view of combination of lectures, practicals and small group discussions (SGD) as shown in Fig 2 .

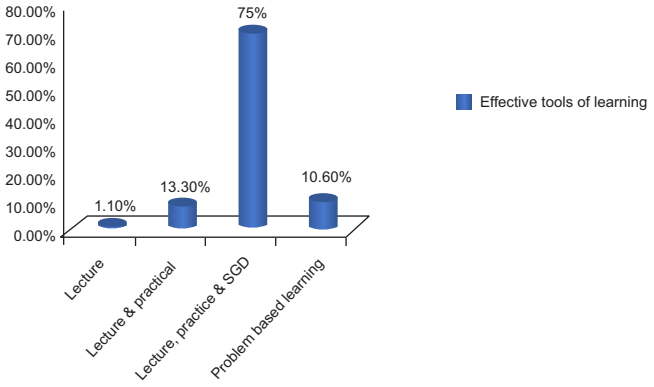

Fig 2: Effective tools of learning in medical college

The preferred medium of teaching was a combination of English and Urdu both by most of the participants (75.6%), only few were in favor of English (18.9%), Urdu (3.3%) and other local languages like Punjabi (2.2%)

Surgeons were the role models of more than half of the participants (59.4%) followed by physicians (18.9%), bureaucrats (3.9%), engineers (2.8%) and others (15%). Males were more inclined towards surgeons, bureaucrats and engineers as role models as compared to females (p=0.025). Majority of the participants wanted to practice medical field as a career in future (96.7%) and to become surgeons (55%), physicians (20%), obstetrician/ gynecologist (14.4%), radiologist (0.6%) and pathologist/nutritionist/anesthetist (6.7%). Regarding gender distribution, all the females intended to persue medical field as a career but males were also interested in fields other than medical for their career (p=0.023)

When inquired about their intention to do specialization in future, 96% were in favor of it. Their preferred fields of interest were surgery (51.7%), obstetrics/gynecology (16.1%), Medicine (10%), pediatrics (8.3%), Radiology (0.6%) and others like Anesthesia/Pathology/Basic sciences (9.3%). Females were more interested in field of obstetrics/gynecology and pediatrics whereas males wanted to choose surgery and medicine as their preferred fields of specialization (p=0.00) while those who didn't intend to do specialization were more interested to work as general practitioners, Civil superior services(CSS) officers or businessmen and no gender differences were observed in it (p=0.07).

DISCUSSION

In our study, majority of the participants joined medical profession due to their passion for accepting intellectual challenges and desire to help others which is in line with the results of study by Labiris G et al on Greek medical students who chose medical profession with the desire of helping patients and scientific basis of the medical knowledge.[6] Males in our study put more emphasis on parents desire of choosing this field for them. A study conducted by Zaib S on first year medical students of Rawalpindi medical college, Pakistan[7] found that 31% of the medical students chose medical field because of parent's desire which is in contrast to the results of our study as only 18.9% of the participants joined medical profession due to their parents' wish which might be due to the fact that they have to self finance the studies.

Bhatti MA et al conducted a study in a private medical college of Rawalpindi and found that the fathers of the children who opted for private medical education were mostly businessmen, doctors, engineers, advocates and judges[8] which is similar to the results of our study as father was the source of financial support in more than eighty percent of the students in our study.

Majority of the students of private medical college wanted to join public medical colleges if the opportunity was given and the most stated reason was a better fee structure as compared to private medical colleges. A cross sectional survey conducted on medical students regarding the choice of medical profession by Saad SM et al mentioned that the primary reason of entering the medical profession by the medical students was to serve humanity[9] whereas financial reward ranked lower in order which is in line with the results of our study.

With advancement in teaching practices, there is an increasing emphasis on interactive sessions, small group discussions and problem based learning. The most effective tools of learning according to majority of the participants were a combination of lectures, practicals and small group discussions. Our results are supported

by a study conducted on students of five medical colleges of private and public sector and the students reported that the lectures should be replaced by clinical sessions and they showed increased interest to move from didactic teaching to problem based learning to enhance active learning.[10]

Surgery was the most opted specialty, followed by obstetrics/gynecology, medicine, pediatrics, radiology and others like anesthesia/pathology/ basic sciences. Similar studies were conducted in France,[11] Kenya,[12] and Bangladesh[13], to highlight the career choices of medical students and found that surgical and medical fields were the most chosen fields for speciality and gender influenced the choice of speciality as obstetrics/ gynaecology, paediatrics and to work as general practitioners were mostly chosen by females. In contrast to the results of our study, Hill EJ reported a significant drop of applications for residency in surgery[14] and Boyle E found only 18% of the students intended to persue surgery as a career.[15] Are C et al. reported the most common reason of not choosing surgery was a perception of unhealthy lifestyle.[16] Very few participants in our study were interested in non-clinical, non-medical fields which is in line with the results of Korean medical schools.[17]

CONCLUSION

Passion of medical profession and getting respect is still the main reason of joining medical profession. The traditional fields of medicine are still preferred by students for specialization.

CONFLICT OF INTERESTS

None

DISCLOSURE OF FUNDING

Nil

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RESEARCH ARTICLE

PATTERN AND IMPACT OF TEA CONSUMPTION ON ACADEMIC PERFORMANCE OF MEDICAL STUDENTS

Aashi Ahmed, Mariam Saqib, Rameen Eijaz, Rafiah Komal, Zainab Javed, Kainat Bashir

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ABSTRACT

Objective: *This study was conducted to explore the pattern of tea consumption among medical students and to determine the association between tea consumption and academic performance of medical students.*

Design: *Cross-sectional study.*

Place and Duration of Study: *This study was carried out at HITEC-IMS, Taxila from January to June, 2020.*

Material and Methods: *One hundred & twenty five students from 1st Year to 4th Year MBBS were invited to participate in this study through convenience sampling. Structured proforma was used to collect data after informed consent. Data were analyzed using SPSS version 26. Mean and standard deviation was calculated for continuous variables like age. Frequencies were calculated for categorical variables like year of study, no of tea cups consumed per day. Chi square test was applied to determine existence of association between different variables and p value was taken significant at < 0.05.*

Results: *Response rate was 92% among total of 1116 participants. The mean age of participants was 21.1 Years (SD=1.34). 98.2 % (n=114) respondents were tea consumers. Dhood patti (tea with more milk) was the preferred type of tea (n=55, 47.4%). Change in tea consumption during examination was reported by 56.9% (n=66) students. 45 (38.7%) students reported to have one cup tea daily, whereas 51 (44.7%) were having 2-3 cups daily. 42(36.2%) students thought consuming tea increased their academic performance. Seven (6%) said that their performance decreased by tea consumption while 67(57.8%) students said that tea had no impact on their academic performance. However, statistically insignificant association was found to exist between tea consumption and academic performance among medical students.*

Conclusion: *Tea is extensively used among medical students to increase alertness, vigilance and to cope stressful academic schedules and assessments with an intension to perform better. However, its use was not associated with better academic performance.*

Students must be educated regarding harmful effects of excessive use of tea and its safe alternatives like decaffeinated tea.

Keywords:

Academic performance, Medical students, Tea

INTRODUCTION

Tea contains caffeine, a CNS stimulant that belongs to Methyl Xanthine organization. It is the widely consumed beverage by two third of world's population. Tea consumption is highly prevalent among college students.[1] Globally, per year, over 120000 tons of caffeine is consumed counting for approximately 70mg per person per day. More than 19,000 studies have been conducted in the past 30 years to explore the effects of caffeine on human body.[2] Many beverages like tea, carbonated soft drinks and energy drinks, chocolate and other cocoa-containing foods contain caffeine, however the major source of its consumption is tea particularly among 14–21 years age group. Amount of caffeine prescribed by European Union is 400mg for adults. One cup of tea comprises of 35–61 mg caffeine and 4.5–22.5 mg theanine. Consumption of tea also has an acute positive effect on stress relaxation which gives evidence

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of reduced cortisol level whereas it shows no impact on blood pressure and heart rate. [3]

Based on the knowledge currently available positive as well as negative, physical and psychological effects of tea have been observed. The acute effects of tea have been attributed to caffeine and theanine while the chronic effects have been associated with other components in tea, such as flavonoids. Caffeine has a stimulant effect and its utilization can increase attentiveness and cautiousness. There is also an association of taste and smell of caffeine with its initiated mood changes.[4] A study carried out by Aga Khan University revealed that 52% of medical students consumed tea to perform outstanding tasks and for attention improvement. In recent studies, the expectation of using tea and caffeine is higher in medical undergraduates. Medical students face tough routines regarding their study and examination, for this reason they lean towards tea.[5] Another survey reported that consumption of tea is favorable for good health involving elevation of mood, reduce anxiety, calming effect, stress-reducing effect, attention improvement, reducing risks of cardiovascular disease. Regular intake of tea has a beneficial psychological effect and provide greater performance which is associated with brain connectivity.[6] It has been demonstrated that caffeine defers the beginning of sleep and upsets rest patterns. Various studies demonstrated that consecutive use of caffeine helps in reducing stress.[7] Routine caffeine use may have remarkably unfavorable impacts on students. Several natural and behavioral changes are observed among youth which is related to certain sleep patterns and use of substances such as alcohol and marijuana. Some studies suggested that consumption of caffeine in the early years of age leads to the use of such substances. Young students use caffeine with the habit of smoking and heavy intake of alcoholic beverages.[8] The National Health and Nutrition Examination Survey (NHANES) of U.S showed that 89 % of adults regularly take caffeine, upon asking from adults and students they reported that the use of caffeine boosts their energy.[9] A study revealed that gargling with black tea extract has a preventative role in controlling influenza infection among high school students.[10] Medical students have hectic academic schedule and extensive assessments. Generally, the consumption of caffeinated drink among students is increased to manage this load and to perform better. Literature is deficient in establishing the relationship between this increased consumption and academic performance particularly in local context. This study was intended to determine the association between tea consumption and academic performance of Medical Students of HITEC-IMS.

MATERIALS AND METHODS

This cross-sectional study was conducted from January to June, 2020 at HITEC-IMS, Taxila. Students of different years of M.B.B.S studying at the Medical College were included in study. Purposive sampling technique was used to collect the data.WHO sample size calculator was used to estimate sample size. By using the proportion of 94%[7] tea consumption among medical students with .05 margin of error and 95% confidence interval, calculated sample was 120. Approximately 125 students were contacted to participate in the study but viable questionnaires were submitted by 116 students. The academic record of previous EOB (End of block) examination was taken from the Student Affairs Department. Students having supplementary or end of block examination at time of data collection were excluded. A structured questionnaire developed after extensive literature review comprising of two sections was used to collect data. 1st section was related to demographic profile of respondents and second section comprising of sixteen questions assessed the pattern of tea consumption and its impact on academic performance, stress, memory, alertness level and sleep during exams. Students consuming at least one cup per day were operationally defined as consumers. Since the amount of caffeine was not measured, therefore depending upon the method of its preparation, tea was categorized into black tea (Strongest), strong tea (strong), separate tea (medium) and dhood patti (mild). Pattern of tea consumption over a period of three months preceding the examination was inquired. Questionnaires were filled by respondents themselves after informed consent and assurance of confidentiality of responses. Data were analyzed using SPSS version 26. The mean and the standard deviation were calculated for continuous variables. Frequencies were calculated for categorical variables. Chi square test was applied to determine association between academic performance and tea consumption. p value was taken significant at <0.05.

RESULTS

The response rate by participants was 92.8%. Out of total 116 participants, majority were females (n=75, 64.7%) and males were 35.3% (n=41). The mean age of participants was 21.1 Years (SD=1.34). Age of respondents ranged from 18-25 years. Out of the 116,

44.8% (n=52) were boarders and 55.2% (n=64) were non-boarders. Majority of the participants were from 4th Year MBBS (n=53, 45.7%) followed by 3rd Year (n=29, 25%), 2nd Year (n=25, 21.6%) and First Year (n=9, 7.8%)

Table I: Tea consumption status according to gender, Year of study and residence

Variable		Tea Consumption		P value
		Tea Consumers	Non-Consumers	
Gender	Male	40 (97.5%)	1 (2.4%)	.66
	Female	74 (98.6%)	1 (1.3%)	
Year of Study	1st Year	9 (100%)	0	.69
	2nd Year	24 (96%)	1(4%)	
	3rd Year	29(100%)	0	
	4th Year	52(98.1%)	1(1.8%)	
Residence	Boarded	51 (98.08%)	1 (1.92%)	.88
	Non-Boarder	63 (98.44%)	1(1.56%)	

Regarding pattern of tea consumption, 98.2% (n=114) participants used tea on regular basis both in the morning and evening. Tea type preferred by majority of students was Dhood Patti (n=55, 47.4%), followed by strong tea (n=33, 28.4%), separate tea (n=15, 12.9%) and black tea (n=4, 3.4%). Only 7 (6%) students reported to take tea in other forms. 56.9% (n=66) students reported to change their tea consumption pattern during examinations, whereas 43.1% (n=50) reported no change.

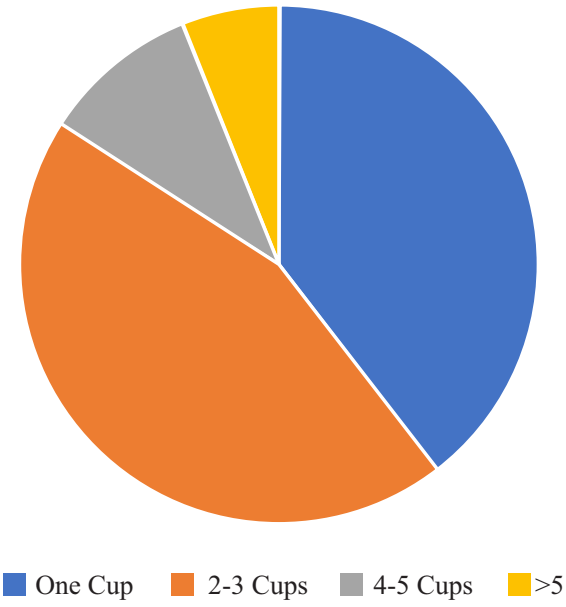

Fig.1: No of tea cups consumed by students per day

Regarding effect of tea on academic performance, more than half of participants reported that using tea doesn't influence their academic performance.

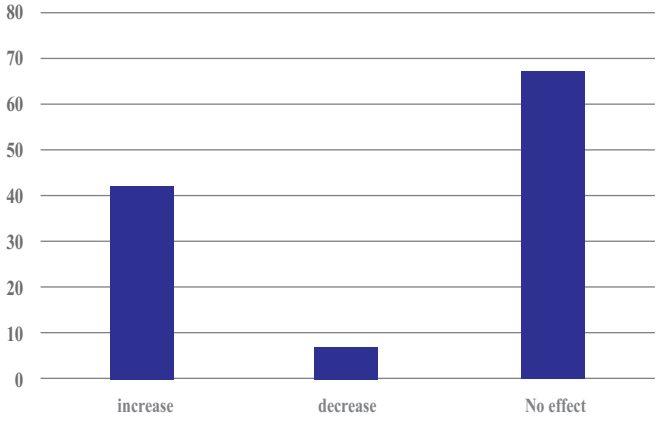

Fig.2: Effect of tea on academic performance

Statistically insignificant association was found to exist between tea consumption and academic success and percentage of marks scored. Similarly, statistically insignificant association was observed between number of tea cups consumed and academic success and percentage of marks scored.

Table II: Relationship between tea consumption and academic performance

Dependent variables		Consume Tea		P value
		Yes	No	
Academic performance in previous professional Examination	Pass	110	2	.93
	Fail	4	0	
%age of marks scored	50%	4	0	.95
	51-55%	2	0	
	56-60%	10	0	
	61-65	21	1	
	66-70	39	0	
	71-75	24	0	
	76-80	9	0	
	80	5	0	

Regarding reasons to consume tea, 66(56.9%) students said that they take tea to relieve stress while 50(43.1%) students said their stress is not relieved by tea consumption. Seventy four students (63.8%) consumed tea to stay alert. 32(27.6%) of students thought their memory was affected by tea consumption. Twenty one students (18.1%) think they perform better than non-consumers, 68(58.6%) thought tea increased their concentration. Regarding sleep pattern among tea consumers 25.8% (n=32) reported to sleep for more than 8 hours, followed by 43.1% (n=50) to sleep for 6-7 hours, 24.5% (n=28) had 4-5 hours' sleep and only 5.2% (n=6) had 2-3 hours of sleep.

DISCUSSION

In our study, we found that majority of students took tea regularly. These findings are similar to a study conducted at Dow University of Health Sciences Karachi which reported caffeine consumption by 94% of the students while 67% consumed tea.[5] Same study reported that 71.5% of students considered improvement in academic performance by caffeine consumption. Reports from Iran also show that tea was the most commonly used beverage among students.[11] In a study conducted in Taiwan, 36.1% of new university students consumed tea regularly. New undergraduate students took less tea as compared to postgraduate students.[7] Our study mainly included students from 3rd and 4th year MBBS, which could be a reason for the high percentage of tea consumers in this study. Another possible reason is the unavailability of other caffeinated drinks at the campus. Most of the students take tea in the morning and evening. Other forms of caffeine intake were not explored in this study. Caffeine was documented to be consumed in form of soft drinks (28.6%), Coffee (22.5%), energy drinks (14.3%) and tablet (0.9%) form in addition to tea (33.8%).[1]

In this study 36.2 % of students thought that tea consumption increased their academic performance, 6.03 % of students said that their academic performance decreased by tea consumption while 57.76% said that their performance was not affected by tea consumption. 26.67 %, 43.1%, 45.45% of students who took 1 cup, 2-3 cups, 4-5 cups respectively reported that their tea consumption had a positive effect on their academic performance, 18.1% of tea consumers thought they performed better than non-consumers. Those who did not take tea reported that their academic performance was not affected by tea. Ninety six and half percent of students cleared their last exam and among those 33.6% said their performance is increased by tea. Among the 4 students who didn't pass their last exam, three considered positive while one reported negative effects of tea on academics.

According to research 52% of medical students of Agha Khan University consumed caffeinated products to increase their productivity.[12] Another survey conducted at medical students in Istanbul showed that the majority of medical students believed their academic performance increased by caffeine consumption.[13]

Around 57% of the students changed their tea consumption patterns during exams. There were multiple reasons for this change in tea consumption patterns; most important was that students believed tea helped them in staying awake and alert. These results are supported by another research conducted at the University Puerto Rico Medical Sciences Campus that says two-third of students consume caffeinated beverages to stay awake during exams.[14] Other studies also reported a high intake of caffeinated drinks among students at times of academic stress. [15]

In our study 63.8% of students consumed tea to stay awake and alert. According to research conducted at US students, 79 % of consumers took caffeinated drinks to stay awake. [9] Other researches also suggested that many young people were taking caffeine to stay awake. Studies have shown positive effects of tea on attention and alertness.[2,8]

In our study 56.9% of the students in our study consumed tea to alleviate stress. Nine percent of US students took caffeinated products to relieve stress. Around 27.6% of the students thought their memory was affected by tea consumption, 58.6% thought that tea increased their concentration, 31% from USA students reported intake of caffeinated drinks to increase their alertness.[9] This difference can be attributed to more tea consumption in the Indo-Pak region. However, consumption of a high amount of caffeinated products particularly coffee has been identified as a risk factor of stress and anxiety in school students.[16]

We studied the effects of tea on sleep hours of students. Most of the students who consumed tea used to sleep for 6-7 hrs a day, 5.2% of students slept for 2-3 hrs, 24.1% for 4-5%, 43.1% for 6-7hrs and 27.6% students slept for more than 8 hrs. A study conducted by Unno K, revealed that those who consumed caffeinated products had fewer sleep hours than non-consumers.[17]

CONCLUSION

Tea is extensively used among medical students to increase alertness, vigilance and to cope stressful academic schedules and assessments with an intension to perform better. However, its use was not associated with better academic performance.

Students must be educated regarding harmful effects of excessive use of tea and its safe alternatives like decaffeinated tea.

Limitations

Subject selection was based on convenience. Most of the participants had good academic records. A study on a group with varying academic performance could better

explain tea effects. Other factors that could affect academic performance like lifestyle, eating habits, and study hours were not considered. The amount of tea consumption was assessed by the number of cups per day rather than the actual amount of tea ingredients in the cups. Questionnaire used for this study should be validated for future researches to establish association between tea and academic performance. The study was conducted on MBBS students of HITEC-IMS only and therefore the results cannot be generalized.

Recommendations

Moderate amount of caffeine consumption in form of tea is found to influence the mental alertness, cognition and mode. However, its role in academic performance in controlled environment is yet to be established. Excessive use of caffeinated beverages may cause addiction. Therefore, students must adopt a healthy lifestyle and consume a moderate amount of tea or preferable decaffeinated products.

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RESEARCH ARTICLE

MEDICAL EDUCATION AS A TOOL FOR TEACHING SKILLS DEVELOPMENT AMONG THE FACULTY OF HITEC-IMS, TAXILA

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ABSTRACT

Background: *Continued Medical Education (CME) of the faculty is imperative for improving the knowledge, skill & behavior of the health professionals as an educator & health care provider. CME helps in acquiring new & updated knowledge of teaching, assessment & patient care. In this way medical teachers & health care providers are better equipped for training the future doctors and bringing innovations in health profession. In this context a study was undertaken at Hitec Institute of Medical Sciences Taxila to ascertain the relationship of CME on professional development of the faculty of medical & dental sciences.*

Methods: *It was a retrospective cohort study in which a group of faculty members who were exposed to CME programs were identified and were compared with a group of faculty members unexposed to any CME activity. A questionnaire regarding assessment of teacher's self-efficacy, teaching competencies, method & medium of teaching and methods of evaluation were administered to both the groups of faculty members of medical & dental colleges. The questionnaire had reasonably high reliability (α=0.90). The results were analyzed and tabulated using SPSS-17. The teacher's self-efficacy, teaching competencies, methods & medium of teaching and methods of evaluations were analyzed separately.*

Results: *The results showed that CME has very pertinent effects on all areas ranging from improving the teachers' competencies for evaluating students' performances.*

Conclusion: *As CME activities are beneficial for upgrading the knowledge & competencies of faculty in training future doctors it should be a continuous process & institutions should encourage & facilitate the faculty in their professional development through participating in different CME activities within & outside the institutions.*

Keywords:

Continuing Medical Education (CME), Continuous Professional Development (CPD), National University of Medical Sciences (NUMS)

INTRODUCTION

Faculty development within medical education encompasses all activities in which teachers take part to enhance their information and expertise in the role of educationalists, administrators, leaders, research investigators, and intellectuals[1]. Faculty growth has been vital in the development, sustenance as well as renewal of academic medical fraternity[2]. Its significance is augmented in the existing atmosphere of curricular transformation. Curricula are shifting from a time-based system (where a certain period of experience leads to accomplishment) to a competency-based medical education (CBME) system(where observation of behaviors and attainment of task-specific milestones lead to competence)[3]. This transformation demands the medical education faculty taking up fresher responsibilities and carrying out the prevailing ones, more skillfully, whilst upholding the eternal devotion of training the future physicians[4]. Only a subject specialist, providing information, will not be adequate. Modern technology is revolutionizing patient care, upgrading

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learning and assessment, communication, and data usage to bring about clinical as well as educational betterment[5].

Continuing Medical education (CME) includes all educational undertakings that serve to keep up, improve, or enhance the knowledge, skills, professional excellence and the links a physician uses to deliver facilities for the patients, the community, or the profession.[6] CME stands for the knowledge and skills largely acknowledged and recognized by the profession like within the basic medical sciences, clinical medicine, and the delivery of health care to the public.[7] Continuing professional development is the practice through which health professionals stay updated to fulfill the needs of their patients, the health services , and their own professional growth. It embraces the unceasing acquirement of latest knowledge, skills, and attitudes to support adept practice. There is no precise divide between continuing medical education and continuing professional development, as during the last decade continuing medical education has encompassed administrative, social, and individual skills, areas ahead of the conventional medical subjects[8].

Continuing professional development, through CME, is an ongoing route through which health professionals & medical teachers keep their knowledge & skills revised to meet the growing demands of teaching & provision of the health services. This will also result in their own professional development and continuous acquisition of new knowledge, skills, and attitudes to enable them in teaching & medical practice.[9] Efficient managing and academic improvement of medical universities and colleges depend on faculty members, on how good they educate, the excellence of the graduates they supply, the healthcare services they impart and their contribution in their scholarly pursuits. The faculty should be able to accomplish these tasks if they update their knowledge & skills through CME [10]. Future doctors should be educated through CME/CPD to implement changes & innovations in curriculum delivery as well as assessment.[11] Medical teachers be encouraged to take part in various CME activities for keeping themselves professionally up to date.[12]

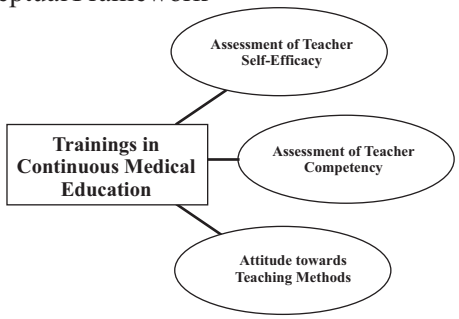
Keeping all this in view, we need to have continuous faculty training activities in our institutions. In this context current research will be conducted to ascertain the relationship between CME and faculty development at HITEC-IMS, Taxila.

As far as we could search, no study has been conducted on this issue in the area. The faculty is training the doctors of tomorrow who will be applying their knowledge and deploying their skills. In this context, learning new methodologies & skill are imperative for the training the undergraduate students. This study intends to assess the impact of continuous medical education on the teaching skills of the faculty which has a direct bearing on the improvement of the product which is our medical graduate. It will help to develop a continuous CME program for faculty at HITEC-IMS in improving their teaching skills.

METHOD AND SUBJECT

After taking permission from the ethical committee of the Institution, a questionnaire based retrospective cohort study was conducted. The study was carried out in both medical and dental college of HITEC-IMS, Taxila. The faculty members were divided into two groups, comprising 30 members in each group place on having acquired a medical education certificate degree or not. By systematic sampling technique every second member fulfilling inclusion criteria i.e., who have completed any of the medical education programs (CHPE or MHPE or similar courses in Medical Education) were selected for a group. Faculty members having teaching experience >30 years were excluded could. This group was compared with the group of faculty members who have not acquired a medical education certification/degree. The respondents participated in the study on voluntary basis, and they were asked to fill the questionnaire while maintaining the confidentiality of the data by giving option to the participants to disclose or hide their identity. The data were analyzed using SPSS-17. Independent sample t-test & Cohen's d was used for assessment of teacher's self-efficacy & teaching competency, while descriptive statistics were used for methods of teaching, medium of teaching and methods of evaluation. Following' responses were converted to percentages and interpreted.

Conceptual Framework



RESULTS AND FINDINGS

Table I: Independent samples t-test result and Cohen's d for assessment of teacher self-efficacy subscale (N=30)

Variables	Groups	*Mean(X)*	*SD*	*T*	*p*	*Cohen's d*
Assessment of teacher self-efficacy	Without CME	49.88	5.23	5.678	.000*	.79
	With CME	53.38	3.64			

*p<.01

When table 1 is examined, it is seen that there is a statistically significant difference in favor of teachers' scores with and without participating in continuous medical education. Assessment of teacher self-efficacy subscales for teachers with CME was X=53.38, p<.01, whereas mean score of teachers without CME trainings was X=49.88, p<.01. The independent samples t-test score on both groups indicated a value of t=5.678. Cohen d value .2, .5 and .8 without considering their sign are interpreted as low, medium, and large effect size respectively (Cohen, 1992). When these values are taken as references, it can be claimed that teaching skill development questionnaire has a nearly high size effect (d=.79) on scores gathered from Assessment of teacher self-efficacy sub scale.

Table II: Independent samples t-test result and Cohen's d for Assessment of teaching competency subscale (N=30)

Variables	Groups	*M*	*SD*	*t*	*P*	*Cohen's d*
Assessment of teaching competency	Without CME	48.72	4.27	4.575	.001*	.81
	With CME	51.08	3.42			

*p<.01

Results of table II revealed that a statistically significant difference is found among teachers' scores with and without training in continuous medical education. Assessment of teaching competency subscales for teachers with CME was X=51.o8, p<.01, whereas mean score of teachers without CME trainings was X=48.72, p<.01. The independent samples t-test score on both groups indicated a value of t=4.575. Cohen d value .81 without considering their sign are interpreted as low, medium, and large effect size respectively (Cohen, 1992). When these values are taken as references, it can be claimed that teaching skill development questionnaire has a nearly high size effect (d=.81) on scores gathered from assessment of teaching competency sub scale.

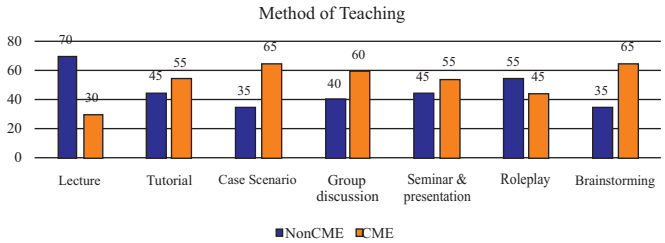


Figure 1: Comparison of responses for Method of Teaching (N=30)

Figure 1 indicates the percentage of responses among the two groups. Lecture method was preferred by non-CME trained teachers (70%) as compared to CME teachers (30%). For tutorial as method of teaching, non-CME group reflected it as less priority (45%) as compared to their counterparts (55%). Case scenario is more preferred by the group who has taken trainings (65%) as compared to those who have not taken any training (35%). Medical education teachers focused more on group discussions (60%), whereas non-medical education teacher have less focus (40%). Seminars and presentations are more in vogue for trained teachers (55%) in comparison to non-trained teachers (45%). Whereas for role play, non- medical education teacher preferred it more (55%) as compared to medical education teacher teachers (45%). Brainstorming as a teaching method was given more priority by trained teachers (65%) as compared to the other group (35%). Findings reveal that tutorial, case scenario, group discussion, seminar/presentation and brainstorming were more preferred teaching methods of those teachers who have got some training in Medical Education. Whereas lecture method and role play are more preferred teaching methods for those teachers who have not taken any training. It indicates that training in Medical Education enhance teaching skills of teachers and increase their competence to adopt synergistic approaches in teaching.

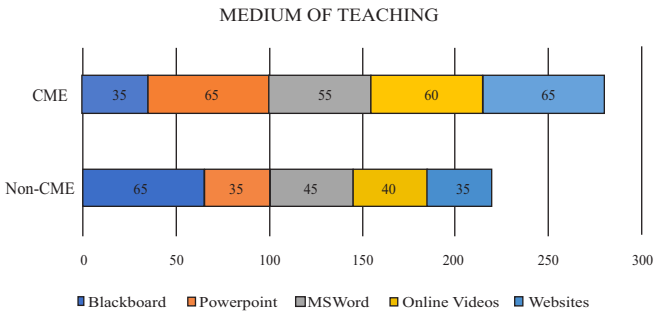


Figure 2: Comparison of responses for Medium of Teaching (N=30)

Figure 2 indicates the percentage of responses among the two groups. Using blackboard as a medium of teaching was preferred by non-CME trained teachers (65%) as compared to CME teachers (35%). For power point as medium of teaching, non-CME group reflected it as less priority (35%) as compared to their counterparts (65%). MS word is more preferred by the group who has taken trainings (55%) as compared to those who have not taken any training (45%). CME trained teachers focus more on Online videos (60%), whereas non-CME trained have less focus (40%). Using Websites as a medium of teaching are more in vogue for trained teachers (65%) in comparison to non-trained teachers (35%). It indicates that trainings in Medical Education enhance teachers' ability to use more innovative medium of teaching compared to their counterparts.

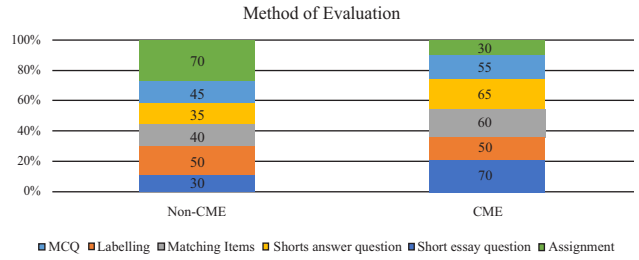


Figure 3: Comparison of responses for Method of Evaluation (N=30)

Figure.3 indicates the percentage of responses on the methods of evaluation among the two groups. MCQ method is preferred by non-CME trained teachers (30%) as compared to CME teachers (70%). For labelling as method of evaluation, non-CME & CME groups reflected in equal priority (50%). Extended matching items is more preferred by the group who has taken trainings (60%) as compared to those who have not taken any training (40%). CME trained teachers focused more on short answer questions (65%), whereas non-CME trained have less focus (35%). Short essay questions are more in vogue for trained teachers (55%) in comparison to non-trained teachers (45%). Whereas assignments as a method of evaluation, non-trained teachers preferred it more (70%) as compared to CME trained teachers (30%). It indicates that trainings in Medical Education enhance evaluation skills and teachers preferred to evaluate in depth knowledge of students by preferring MCQs as a best method for evaluation.

DISCUSSION

Continuing medical education is a lifelong process, through which physicians, medical teachers and other health professional engage in different educational activities, which are designed to help them in their professional growth. It facilitates life-long learning among medical faculty so that their practices may reflect the best medical care for their patients and training to the future doctors[9]. The data in figure 1 & 2 was in support of the overall positive impact on the professional development of the teacher, reflected in i enhancement in their self-efficacy as well as their ability to teach the undergraduate curriculum. The statistical difference among both the groups is very significant as CME trained teachers are better equipped to teach the students in a newly emerging institution having developmental constrains[13]. Their competency to deliver curriculum is very encouraging and motivating to other faculty members who are seeking opportunities of training in their respective fields.

The questionnaire regarding the methods of teaching revealed a paradigm shift from conventional methods to more interactive critical thinking and activity based. CME trained faculty preferred small group teaching like case-based learning, tutorial, presentation in mini seminars, brain storming and group discussions. Large group format lectures are advocated more by non-CME group (70%), while 30% of CME group were of the view that lecture in large group is the still a very effective mode of teaching. In nutshell continuing medical education is helping the faculty to adopt interactive modes of teaching thus inculcating deep learning in the students and the results show greater congruence with recent studies.[14]

While 65% of non-CME trained teachers (65%) advocated black board teaching more useful whereas reciprocally a similar percentage of CME trained opted for power point presentations as compared to CME teachers (35%). For power point as medium of teaching, non-CME group reflected it as less priority (35%) as compared to their counter parts (65%). They are of the opinion that higher order thinking activities like search web and online videos were more helpful in broadening the base of learning. The non-CME trained faculty is hesitant and less enthusiastic in adopting latest medium of learning. This may be because the faculty, needs more training on the development of active learning sessions before implementing in the curriculum.[15]

Evaluation is the process in which a teacher observes the performance of students. It gives an idea about the quality of training and level of learning of students. In this research MCQ method was preferred by non-CME trained teachers (30%) as compared to CME teachers

(70%). Most of the teachers were of the view that although MCQs are better for evaluating in depth knowledge, but they are difficult to develop and need standardization before deployment in examinations. Moreover, we cannot ignore the importance of short answers as they develop writing skills in students. Labelling of a diagram or figure was advocated equally by both groups. Regarding assignments which enhance the creative and writing skills, 70% of non-CME trained teachers preferred them compared to 30% by the others. There are multiple pros and cons of different evaluation methods. So, for assessing student knowledge and performance a variety of methods can be used to overcome the shortcomings of one by the advantages of others.

CONCLUSIONS

CME has a positive effect on the professional growth of faculty in specific and generally, it improves the teaching abilities of the faculty. This in line with the latest trends in medical education which are followed in the curriculum designed by the National University of Medical Sciences (NUMS).

RECOMMENDATIONS

Hitec-Institute of Medical Sciences is one of the emerging medical & dental institutes of the country, it is therefore recommended that formal continuous programs of CME for the basic & clinical faculty should be formulated. This will not only enhance the professional growth of the faculty but also continuously upgrade the institution in the list of health institutions of the country in specific and globally in general.

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RESEARCH ARTICLE

EVALUATION OF CLINICAL FEATURES OF COVID-19 AND OUTCOME OF HOME MANAGEMENT

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ABSTRACT

Background: *Along with control measures, the awareness of disease pattern and consideration of home management might help in decreasing the patient burden on health care facilities. The objectives of study were to evaluate the clinical presentations of COVID- 19 among the patients and assess the outcome of home management.*

Design: *Descriptive observational study.*

Place and Duration of study: *Different areas of Rawalpindi and Islamabad, conducted from May to November 2020.*

Patients and Methods: *A self-designed validated proforma was used to collect personal and clinical data from PCR positive COVID -19 patients. It included the information about city of residence, age, sex, exposure to COVID -19 patient, comorbidities, clinical symptoms, radiologic findings, laboratory findings, complications, treatment, and clinical outcome. The data were processed by SPSS 25 and the descriptive statistical values of the variables were calculated.*

Results: *Among the 100 study participants most of the patients were young adults in the 21-30 years age group. The symptoms were present in 88% of patients. The most common symptoms were fever, body aches, fatigue and sore throat. The comorbidities including hypertension, diabetes mellitus, asthma, musculoskeletal, gastrointestinal and cardiac disorders were present in 35%. All of the patients were quarantined at home but 13% were hospitalized later. The patients using Azithromycin were 55%, analgesics 69%, vitamin supplements 50%, herbal qahwas 50% and special diet 37%. About 73% of patients focused on prayers and supplications. The patients cured after home quarantine were 87 %. After hospitalization, 9% were cured and 4% died.*

Conclusion: *The patients with any comorbidity were the candidates of severe disease. Home quarantine, boosting of immunity and faith were found to be the effective measures for recovery from the disease.*

Keywords:

clinical features, COVID-19, outcomes, SARS-CoV-2, treatment

INTRODUCTION

The COVID-19[1,2] pandemic caused by SARS CoV-2[3] started in December 2019 at Wuhan (China). [4,5] The Coronavirus family members cause diseases in mammals and birds like cows, pigs, bats and chickens. SARS CoV-2 is genetically similar to bat coronaviruses, and shares about 79% and 50% of its genetic sequences with the SARS and MERS viruses respectively.[3] The seven Corona virus strains transmitted by respiratory aerosols cause a significant percentage of common colds in human adults and children, particularly during winter and spring seasons. It is characterized by rhinorrhea, scratchy sore throat, fever and swollen adenoids and may last for several days with no sequelae. In addition to pneumonia and viral or secondary bacterial bronchitis in some cases, the strains can also lead to severe diseases like Severe Acute Respiratory Syndrome (SARS), characterized by fever, cough, dyspnea, chills, rigors, headache, leukopenia, thrombocytopenia; Atypical pneumonia, kidney failure and even death in elderly above 50 years age. The strains infecting humans led to global pandemic by person to person spread e.g. between family members and health care workers.[6] The incubation period is 2-14 days, median 5-6 days.[7, 8]

The global emergency was declared after the emergence of COVID-19 that inflicted serious health and economic burdens. The various reasons suggested for its spread

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into different countries with different pace include geographical, social, religion and genetic factors[7]. The low incidence of disease and death rate in Pakistan could be due to increased immunity by endemic malaria and tuberculosis, BCG vaccination, high environmental temperature and genetic predisposition[8-9], as compared to other countries particularly Europe and United States of America.[10]

The study of disease pattern is important to deal with the pandemic amicably along with extensive precautionary and control measures to manage the disaster. The awareness of clinical features help in saving the vulnerable group of children, elderly people and health care workers. For Quarantine of suspected patients and their isolation led to increased patient burden on health care facilities. This aroused the need of home management. The study aimed at assisting the local authorities and clinicians in better management of patients and prevention of disease progression through increased awareness about the clinical features and course of disease. The objectives of study were to evaluate the clinical presentations of COVID 19 among the patients in twin cities of Rawalpindi and Islamabad and to assess the outcome of home management of the disease.

METHODOLOGY

It was a survey based descriptive study, conducted on patients from different areas of Rawalpindi and Islamabad, during the period from April to November 2020 after the approval of institutional review committee. The patients were randomly selected for the study and inclusion criterion was positive SARS CoV-2 PCR test, with or without symptoms or history of exposure to infected patient. The patients who were being diagnosed on the basis of positive corona antibodies, mentally handicapped or pregnant female were excluded. A self-designed validated proforma was used to collect clinical data from Covid-19 patients or the responsible surrogate in case of children and hospitalized patients. They were contacted over phone, explained about research and interviewed after getting the verbal consent. The data were obtained and recorded in the proforma. The data included patient's personal information, city, history of exposure, presence of medical comorbidities, clinical symptoms, radiologic and laboratory findings, complications, treatment, and clinical outcome of patients. The data were processed by SPSS 25 and the descriptive statistical values of the variables were calculated. The p value of <0.5 was considered significant.

RESULTS

Out of total 100 SARS CoV-2 PCR positive patients, 41.6% were from Islamabad and 58.4% from Rawalpindi, with male to female proportion of 53:47. The patients were divided in seven age groups. Group 1(1-10), Group 2(11-20), Group 3(21-30), Group 4 (31-40), Group 5 (41-50), Group 6 (51-60) and Group 7 (above 60) the frequency of patients in different age groups are shown in Fig. 1.

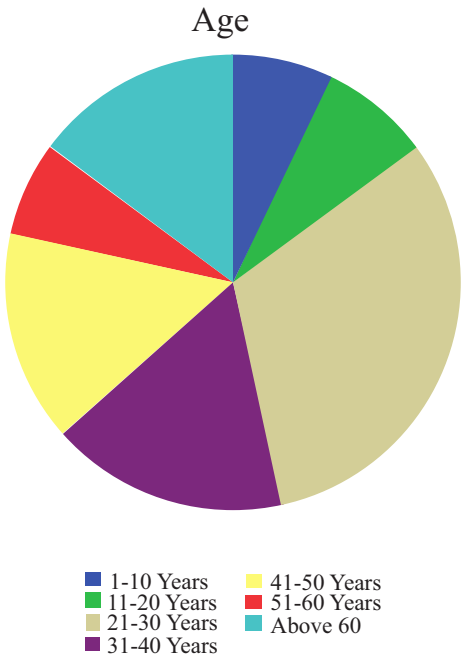

Fig. 1 The frequency of patients in different age groups

The swab samples for SARS CoV-2 PCR testing were taken from oropharynx in 18%, nasopharynx in 50% and both nasopharynx and oropharynx in 32% patients. About 49% were tested for SARS CoV-2 PCR because of symptoms, 24% had history of contact with corona patient, 18% had both disease symptoms and contact history and 3% were care givers. The persons tested for miscellaneous reasons (health care worker, job requirement or rejoining colleges etc.) were 6%. The patients with PCR test done once were 24%, twice 45%, thrice 26% and four times were 5%.

The symptoms were present in 67% patients before diagnosis by positive PCR test, 21% after a positive PCR test, while 12% were asymptomatic. The most common symptoms were fever, body aches, fatigue and sore throat. The frequencies of different symptoms are shown in table I.

Table I: The frequencies of symptoms present in COVID-19 patients. (n = 100)

Symptoms	Frequency	Symptoms present	Frequency
Fever	66%	Respiratory distress	4%
Body aches	44%	Vomiting	3%
Fatigue	44%	Rash	2%
Sore throat	42%	Vertigo	1%
Cough	37%	Psychologic Symptoms	46%
Ageusia	33%	Irritability	25%
Headache	32%	Sadness	23%
Anosmia	26%	Hopelessness	12%
Diarrhea	22%	Recurrent thoughts	9%
Rhinorrhea	21%	Social withdrawal	9%
Dyspnea	18%	Crying spells	9%
Dizziness	13%	pleasure Lost in doing	9%
Abdominal pain	8%	Difficult concentration	8%
Chest pain	8%	Forgetfulness	8%
Neck pain	6%	Guilt feeling	6%
Chills	6%	conflicts with others	3%
Nausea	5%	Increased smoking	3%
Palpitations	4%	tremors	2%

The comorbidities were found in 35%, including hypertension 13%, diabetes mellitus 10%, Asthma 6%, musculoskeletal 6%, gastrointestinal 5% and cardiac disorders 4%, and mental disorder 1%. About 29% were taking medicine for their primary disease. Laboratory tests were done in 39% patients. The results of different investigations done are shown in Table II.

Table II: Types and results of investigations done in patients

Investigations	Done in patients	Result	
		Normal	Abnormal
CBC	34%	20%	Leucopenia 5%, Leukocytosis 1%, Hb 3%, Thrombocytopenia 3%
CRP	14%	4%	Raised 10%
Ferritin	4%	3%	Raised 1%
D Dimers	3%	-	Raised 3%
LDH	2%	2%	-
S. albumin	1%	1%	-
Chest X-ray	39%	24%	15%
CT Chest	4%	2%	2%
Blood group	86%		A+ 18, A- 1, B+ 30, B- 3, AB+ 8, AB- 1, O+ 23, O- 2

All the patients were quarantined at home by themselves, or on advice of doctors and peers. About 40% patients took self-medication. The consultation was taken from allopathics by 35%, homeopathics 4% and social media advice 11%. No treatment was taken 10% patients, out of which 8% focused on supplications and herbal fluids. The types of treatments taken by patients at home are shown in Table III.

Table III: Types of treatment taken by Covid-19 patients

Types of management	Details
Antibiotics	Azithromicin alone 55%, with Cephalosporin 3%, with Flagyl 3%, Antimalarial 6%, Ivermectin 1%
Symptomatic and other treatments	Analgesics and antipyretics (Paracetamol, Panadol) 69%, Antiallergics 13%, Oxygen 6%, Gargles 5%, Steam inhalation plain or with Vicks 4%, Homeopathic 4%, Enoxaparin Sodium 2% Steroids, Antiemetic, Colic drops, Mucaine, Zantac1% each
Supplements	VitaminC 20%, Vitamin D18%, Multivitamin 14%, Calcium10%
Fluids	Herbal Qahwas of Sanamakki/mint/cinnamom /ginger/green tea /joshanda, Fruit juices, chicken/meat soups 50%, IV fluids 2%, ORS 1%
Special Diet	Soft diet, High protein diet, Dry and fresh fruits 37%
Spiritual therapy	Prayers, Supplications, Tasbeehat 75%

The outcome of home management was recovery in 87 % cases. The remaining thirteen patients were hospitalized due to severe symptoms, out of which 9 were cured and 4 died.

DISCUSSION

The COVID -19 pandemic disseminated rapidly around the globe after its identification in China. The first 41 hospitalized cases in Wuhan China, presented with symptoms like fever, cough, myalgia and fatigue[11]. The first confirmed case in United States with the initial mild symptoms progressing to pneumonia on day 9 of illness led to the description, identification, diagnosis, clinical course, and management of disease[10]. The similar viral loads in asymptomatic and symptomatic cases indicate these to be potential source of transmission. The asymptomatic and pre-symptomatic cases reported by different studies ranged from 6 to 48%[12-18], which remained towards higher side of range in our studys. Fever, cough, fatigue were the commonest symptoms reported in our and other international studies[15,16, 19.] The international studies reported highly variable prevalence of symptoms. The frequency of fever in our study was less as compared to other studies which varies from about 69% to 89% [15-20]. Dyspnea was found in 18% in our

study where as in one study it was reported to be 10.1%[15], while it was higher 19% to 30% in other studies[14, 18, 19]. Cough was present in our study population as in 37% & sore throat in 42% whereas it was reported in high number of patients (30% to 72%) in other studies[4, 15, 17-22]. Fatigue was one of the important finding and almost half of our study population had this symptom whereas most other studies revealed lesser chance of fatigue from about 6% to 40% [15, 17-21]. However, one study showed higher incidence of fatigue (63%)[22]. In the literature the comparable symptoms of chest pain, dizziness, diarrhea, nausea, vomiting and abdominal pain[17-20] were found. Ageusia was reported less (5% to 9%) [15-19]. The symptoms like hyposmia[19], gustatory dysfunction[22] and anosmia[15,22], headache[17,22,23], were variable in different studies. The presenting symptoms found in patients were usually common to many respiratory diseases, variable in different studies and none was specifically associated to COVID-19 to help in screening the patients. The symptoms alone may not be enough clues because of substantial number of asymptomatic cases. The pandemic phobia also led to psychological symptoms, but these were not mentioned in the studies we consulted. The frequency of different psychological symptoms except irritability and sadness was low which reflects better psychological stability in the patients. The incidence of co-morbidities in one study reported as 17.7%[15] was similar to our study. The people had PCR test done for early diagnosis and management because of awareness of common symptoms, after exposure to patient as precautionary measure or job requirement. Only one third of them got other diagnostic investigations done. Our patients had lower levels of diagnostic parameters as compared to C- reactive protein in 68.6%[18], 84%[20]. the leucocyte count was found to be normal in 37% or low[21] but lymphopenia was higher in 57.4%18, 43%[20], increased lactate dehydrogenase 51.6%[18] reported in a review. The abnormal chest computer tomography was found in 96.6%[11] patients, most frequently with ground-glass opacities (80%) and bilateral pneumonia (73.2%).[17]

In consensus with our results, a higher percentage of mild to moderate disease had been reported in other studies was 96%[15], 89.5%[14]and 86%[9] cases who recovered after home quarantined with or without any treatment. Despite the documented low rate 1- 10%[10] of secondary bacterial infections, the use of antibiotics similar to our results was found to be 45% irrespective of their disease severity[7]. The antibiotic use had been higher from 61%[15], 71.5%[17] in overall and to 92%[23] in hospitalized patients. The antibiotic choices were different in different countries, for example azithromycin was most commonly prescribed alone to 41%[16] cases, or with more than one antibiotics like doxycycline[19], levofloxacin[6], moxifloxacin[1] and ivermectin[20] in different countries. The few recovered patients after hospitalization in our study, did not know about the antibiotics prescribed to them. While internationally, the hospitalized patients received Amoxycillin-clavulanate alone or with azithromicin / clarithromycin in 46.6%, ceftriaxone plus azithromicin in 29.1%, broad-spectrum Beta lactams alone or with Azithromicin or Vancomycin in 12.9%, hydroxychloroquine / chloroquine in 27.6%[24,25] and antivirals in 90%[18] and 26%[16] cases. The use of antibiotics like cephalosporin, metronidazole, antimalarial or antiviral, steroids and oxygen was very limited in our study. The meta-analysis found lesser number of patient requiring mechanical ventilation 9% and oxygen 2%[19]. The treatments with agents like antiviral nucleotide analogue remdesivir, systemic interferons and in particular interferon β-1a, dexamethasone, hydroxychloroquine, convalescent plasma was either rare or none in our study. The percentage of patients using treatment strategies advocated on social media, homeopathic drugs, herbal fluids, specific foods and vitamin supplements were not found in consulted international studies in references. Few patients used Homeopathic medicine and steam inhalation.

As compared to the estimated prevalence of 25.6% 18, [18] 1%[21] in other studies, severe disease was less in our study. Acute respiratory distress syndrome (ARDS) had been the most common complication (15.7%)[18] in hospitalized patients. The incidences of hypertension, cardiac diseases and diabetes in fatal cases, were 16.4%, 12.1% and 9.8%[23] respectively in a Chinese study. In hospitalized patients, ventilator associated pneumonia with Enterobacteriaceae or non-fermenter Gram-negative bacilli was reported in 50.9%, bloodstream infections with coagulase negative Staphylococci or Enterobacter complex in 29.1% patients as hospital acquired infections and death rate in 40.5% cases[24]. The similar fatal outcome of 3.6%[18], 7%[19], 4.3%[11, 21], 4%[17] in general cases is reported in other studies.

CONCLUSION AND RECOMMENDATIONS

The study provided an insight of clinical features and COVID -19 disease progression. Majority of patients had mild to moderate disease and recovered satisfactorily after home management. Many of the

symptoms in different areas were common with variable frequencies. The declaration of pandemic urged the patients to take the symptoms seriously and get PCR test done. The severe disease and fatal outcome occurred in patients with comorbidities requiring hospitalization. The research on herbal therapies is suggested for any possible role in recovery from disease.

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RESEARCH ARTICLE

ANATOMY MULTIPLE CHOICE QUESTIONS ITEM ANALYSIS: DISTRACTOR EFFICIENCY ASSOCIATION WITH DIFFICULTY AND DISCRIMINATION INDICES

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ABSTRACT

Objective: *To determine the association of distractor efficiency with difficulty and discriminatory indices in Anatomy multiple choice questions (MCQs).*

Design: *Cross-sectional.*

Place and Duration of Study: *Department of Anatomy, Army Medical College, National University of Medical Sciences Rawalpindi from January 2020 till July 2020.*

Materials and Methods: *About 215 MCQs of Anatomy of both MBBS and BDS classes through convenience sampling were selected. The MCQs were obtained through optical marks recognition data from the examination branch along with variables of interest, i.e., distractor efficiency, difficulty index and discrimination index. Data were analyzed in STATA Version 14 and SPSS version 26.*

Results: *The mean distractor efficiency was 64.96 ± 34.28, the mean difficulty index was 65.22±22.53 and the mean discrimination index was 0.30±0.13. Distractor efficiency has a significantly strong negative association with difficulty index (r = -0.73, p=0.001) while a significantly weak positive association with discrimination index (r= 0.20, p=0.002).*

Conclusion: *The Anatomy MCQs item analysis showed that distractor efficiency is negatively correlated with difficulty index but positively correlated with discrimination index.*

Keywords:

Assessment, Distractor efficiency, Difficulty index, Discrimination index, Multiple Choice Questions

INTRODUCTION

Evaluation or assessment is a step wise process of forming an opinion about the quality and depth of student performance and accomplishment, then concluding regarding the learning process at the end.[1] Assessment drives learning emphasizes the central role of assessment in any form of education and particularly in high stake medical education assessments. Multiple choice questions (MCQs) items are the most common method of assessing the knowledge capabilities of undergraduate students in medical colleges. Framing meaningful MCQs is a time consuming and challenging process. The correctly formed MCQs result in unbiased analysis that measures understanding, knowledge, application, and assessment.[2] MCQs to be used must be of good quality, and they need to be tested for that standard or quality. Interpretation of post-exam item analysis report and modification or improvement of MCQs accordingly is an essential prerequisite to maintain good quality MCQ bank as required by the regulatory bodies like Pakistan Medical Council (PMC). Item analysis[3] is an essential step in the development of any assessment strategy.[4] The phase helps us identify an item that is either too difficult or too easy for the examinee. This process also helps in detecting items that fail to discriminate between skilled and unskilled examinees. Item analysis also gives a view of the process of instructions. If correctly sampled,

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the items will inform whether the subject/topic/concept has been learnt and understood by the learner. Proper assessments will decipher the grey areas, misconceptions and low clarity zones that require the attention of the learner and facilitator both.

In item analysis, the process checks the effectiveness of test items by the score of the exam and sorts the results by score. Based on student results, the measurement of difficulty and discrimination indices and the correlation of marks will provide proof of validity. The complexity of the test item and its discrimination power (DP) may provide supporting evidence of the accuracy of the examinations.[5]

The difficulty index is the percentage of participants who correctly attempts the exam item (e.g. single question in the best response form MCQ paper).[6] Its calculation is simply by dividing the participants who have passed the exam item by the participants who have not cleared the exam items.[7] A simple item may have a high discrimination index (e.g., 0.9) while a hard item may have a low discrimination index (e.g., 0.1). The degree to which success or failure on a test item indicates possession of the ability being measured is referred to as the discriminatory index of a test item. It determines how discriminating an item is among examinees in terms of the function or ability it measures. This number might be anywhere between 0.0 and 1.00. The higher the value, the greater the item's discrimination.[8] The discrimination power has the capability to differentiate between a low performing student and a high performing student. The DP is the ability of a test item to distinguish between high and low performers. For DP calculation, firstly the students are ranked in order of their scores/marks achieved in the examination. Then the students in the uppermost third and bottom-most third are calculated. Then the percentage of students correctly attempting the MCQs item in the bottommost third is subtracted from the percentage of students in the. uppermost third. A positive DP is desired. A negative DP needs to be assessed and corrected.[7,8]

A MCQs item analysis showing a low discrimination index may have many reasons: that is it may be out of the syllabus; the teaching methodology was flawed or ineffective; the construct of the item is not proper; students have not understood the topic properly.[9, 10] An error in the MCQs can be detected by a negative value: it means that the students identified as low performers are answering more accurately than the students who are high performers: this means that the MCQs item is flawed in the construct, examination misconduct was there or the answer was incorrect. Therefore, a negative discrimination index needs evaluation and improvement. The MCQs construct shall aim to avoid non-functional distractors completely and add functional distractors, the ones that are incorrect but shall be able to differentiate between low and high achievers.[11]

Distractors had been extensively investigated in terms of guessing probability, but their impact on other item analysis parameters like difficulty and discriminatory indices generally remained out of focus. Hence, this study was planned to determine the association of distractor efficiency with difficulty and discriminatory indices in Anatomy MCQs at Army Medical College, Rawalpindi.

METHODOLOGY

This cross-sectional study was carried out at the department of Anatomy, Army Medical College, National University of Medical Sciences. The study commenced after obtaining permission from the Institutional Ethical Review Committee. The sample size was calculated by using the software G-Power version 3.1.9.4, Considering the values of effect size as 0.20, alpha error probability as 0.05 and power of the test as 80% as the sample size of 191 was calculated. However, we took a sample of 215 MCQs of Anatomy of both MBBS and BDS classes through convenience sampling. Optical marks recognition (OMR) data related to the MCQs were obtained from the examination branch, and variables of interest, i.e., distractor efficiency, difficulty index and discrimination index, were analyzed.

Distractor efficiency was calculated based upon a number of non-functional distractors (NFDs). Any distractor attempted by less than 5% of the students was declared as NFD. Zero NFD means 100% distractor efficiency, 1 NFD means 66.67% distractor efficiency, 2 NFD means 33.33% distractor efficiency and 3 NFD means 0% distractor efficiency.

Based on the difficulty index, the MCQs were divided into three categories. MCQs with less than 30% difficulty index were classified as 'hard', those from 30 to 70% difficulty index were classified as 'moderate', and the MCQs with greater than 70% difficulty index were classified as 'easy' MCQs.

Similarly, the MCQs were divided into three categories based on the discrimination index. MCQs having

discrimination index less than 0.2 were classified as poor, those from 0.2 to 0.39 as good and the MCQs with discrimination index over 0.4 were classified as excellent.

The data were entered in STATA Version 14 and SPSS version 26 for analysis. For continuous variables, mean, and the standard deviation was calculated while for categorical variables, frequency and their percentages were calculated. The correlation between numerical variables was calculated using the spearman correlation coefficient as the data was not normally distributed. Whereas the association between categorical variables was calculated using the Chi-Square test. The p-value of less than or equal to 0.05 was considered significant.

RESULTS

Descriptive analysis of 215 Anatomy MCQs is shown in figure 1. Pie Charts in the figure (Ia, Ib, Ic) shows the frequency and percentage of the MCQs in each category of distractor efficiency, difficulty index and discrimination index. Figure Id shows the mean and standard deviation of all three variables.

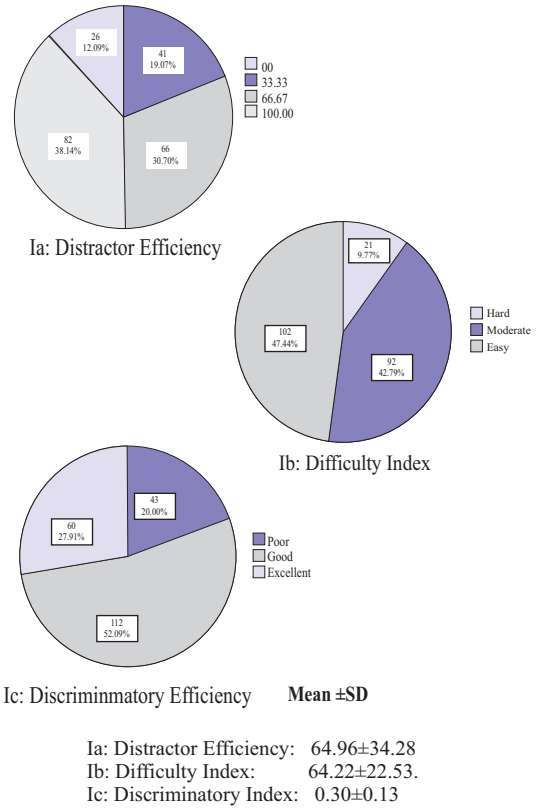

Fig 1: Descriptive analysis of distractor efficiency, difficulty index and discriminatory index showing frequency, percentage, mean and standard deviation (SD)

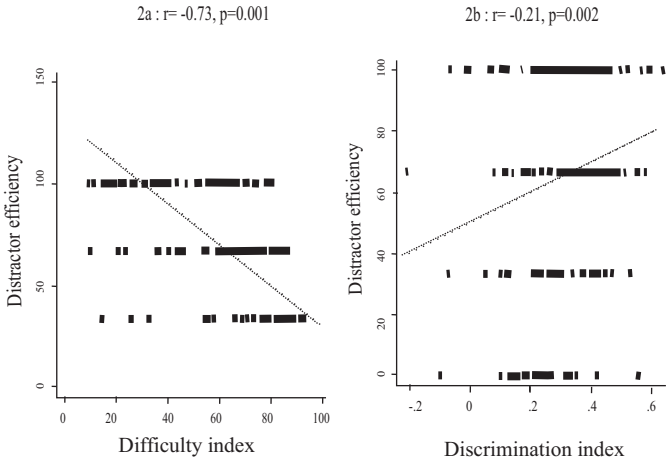

Figure 2: Correlation of distractor efficiency with difficulty and discrimination indices

The scatter diagram in figure 2 shows the correlation of distractor efficiency with difficulty and discrimination indices along with values of correlation coefficient and alpha error (p-value). Figure 2a shows a significant negative correlation between distractor efficiency and difficulty index ($p<0.001$) while a significant positive correlation between distractor efficiency and discrimination index ($p=0.002$). However, the strength of the correlation is high with difficulty index but weak with discrimination index as shown by the 'R-values'.

Frequency/percentage comparison of MCQs in each category of distractor efficiency and difficulty index is shown as cross-tabulation in table 1. It is evident from the table that out of the 215 MCQS, as there is an increase in distractor efficiency, the difficulty index increases. The distractor efficiency of 33% and 66.67% have mostly the moderate and easy difficulty index, which means that there is at least 1-2 distractor with 100% distractor efficiency.

The table I shows that frequency/percentage of MCQs in 'hard' category of difficulty index increases with the rise in distractor efficiency whereas that in 'easy' category decreases and the association between the two variables is statistically significant ($0<0.001$).

Table II shows the frequency/percentage comparison of MCQs in each category of distractor efficiency and discrimination index. The frequency/percentage of MCQs in 'excellent' category of discrimination index increases with the rise in distractor efficiency whereas that in 'poor' category decreases and the association between the two variables is statistically significant ($p<0.001$).

Table I: Association of distractor efficiency with a difficulty index

		Difficulty index			p-value
		Hard	Moderate	Easy	
Distractor efficiency	0%	0	0	26(100%)	<0.001
	33.33%	2(4.88%)	6(14.63%)	33(80.49%)	
	66.67%	3(4.55%)	29(43.94%)	34(51.52%)	
	100.00%	16(19.51%)	57(69.51%)	9(10.98%)	

Table II: Association of distractor efficiency with discrimination index

		Difficulty index			p-value
		Poor	Good	Excellent	
Distractor efficiency	0%	11 (42.31%)	13 (50.00%)	2 (7.69%)	<0.001
	33.33%	6 (14.63%)	26 (63.41%)	9 (21.95%)	
	66.67%	13 (19.70%)	32 (48.48%)	21 (31.82%)	
	100.00%	13 (15.85%)	41 (50.00%)	28 (34.15%)	

The total Anatomy MCQs item analysis has shown the mean, standard deviation of distractor efficiency to be 64+34.28, difficulty index of 65.22+22.53 and discrimination index of 0.3+0.13. There are 38.14% of the MCQs having three functional distractors with the majority of them having a moderate difficulty index (42.79%) and a discrimination index of 52.09%. A strong significant negative association (r= -0.73, p=<0.001) is found between distractor efficiency and difficulty index while a weak positive significant association (r= 0.21, p<0.002) between distractor efficiency and discrimination index is established. In the Anatomy MCQs item analysis, there was a large number of MCQs with having three functional distractors of moderate difficulty index (69.51%). While the MCQs having one and two distractors were mostly of the type having moderate (43.94%) and easy difficulty index ((80.49%) respectively.

DISCUSSION

In the educational institute, the MCQ quality can be evaluated on the distractor efficiency, difficulty index and discrimination index.[12] The distractor efficiency, difficulty index and discrimination index are among the instruments to check whether the MCQs are well constructed or not. Distractor efficiency analyses the quality of distractors and is closely associated with difficulty and discrimination indices. A distractor used by less than 5% of students is not a significant distractor and should be either replaced or corrected as it affects the overall quality of the question.

In a study conducted in Saudi Arabia Nursing Institute, the mean distractor efficiency was 74.3% which is more than the mean distractor efficiency of this study that is 64.96+ 34.28. In the same study, the difficulty index and discrimination index had a negative correlation (r = -0.721; p<0.01) while in this study it was also a negative one that is - 0.08 but increased in comparison.[13]

The distractor efficiency of difficult items in this study is 100%, which was expected, as difficult items would require much guesswork on the part of the student, thereby using all the distractors. We observed that items having one NF-D had excellent discriminating ability (difficulty index = 0.427) as compared to items with all four functioning distracters (difficulty index = 0.351). This compares well with other studies favouring better discrimination by three distracters as compared to four.[14]

Distractor construction is often a difficult task and yet an essential element of an MCQ construct. A distractor selected by <5% of the graduate is categorized as a poor distractor.[6] It is quite challenging to construct an MCQ with more than three plausible distractors, and so the fillers are added.[15] In one study, 39% of the MCQs were having two plausible distractors, indicating difficulty in the construction of three plausible distractors. Through item analysis, the instructor shall be able to remove non-plausible distractor and replace it with a more appropriate one.

In a study conducted in Pakistan, many MCQs were having difficulty index of 81% and discrimination index of 83% in comparison to this study which has shown 47.44% of easy difficulty index and 28% of excellent discrimination index.[16,17] The item analysis of 48 MCQS showed the mean difficulty index of 67.5 and mean discrimination of 0.44 as compared to the 65.22 and 0.3 respectively.[12]

The quality of MCQs has a significant impact on the test analysis. About 40 MCQs analysis showed a mean discrimination index of 0.22, which is lower than in this study that is 0.3+0.13.[18] As we have not randomly selected the MCQ for analysis, there might be a chance of having sampling bias. So the association between distractor efficiency and discrimination index must be re-evaluated in further studies with larger sample sizes and random sampling. The evaluation of student's cognitive knowledge through MCQ shall be based on information of the subject rather than recall only. In another study, the discrimination index was 0.26 which is again less than this study that is 0.3+0.13.[19]

Framing concise MCQs is a time-consuming and challenging process. It is said that appropriately

constructed MCQs result in objective testing that can measure knowledge, comprehension, application, analysis, and evaluation.[2] The MCQ medium is English which is not the native language of the student is so the evaluation might be affected by the language bias/reading ability. It is not possible to construct medicine MCQ in the Urdu language, but if in future they are constructed, the language validity of the MCQ can be checked through item analysis in all the MCQ pools.

CONCLUSION

Distractor efficiency is negatively correlated with difficulty index but positively correlated with discrimination index.

While constructing MCQs, this fact needs to be kept in mind because the addition of non-functional distractors, which is not uncommon, will reduce the quality of MCQ by not only decreasing the distractor efficiency but adversely affecting other item analysis variables like difficulty and discrimination indices.

ETHICALAPPROVAL

The Ethical Review Committee approval was taken before the conduction of the study.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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ASSOCIATION OF TYPE 2 DIABETES WITH MT DNA *A3245G* GENE POINT MUTATION – AN UPDATE

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ABSTRACT

Diabetes Mellitus (DM), a constantly occurring, multifactorial disorder, has victimized large groups of population all over the world. Apart from hormonal and metabolic defects, the responsible underlying molecular events for the development of the disease have been subjected to painstaking study during the last decades but despite the hard work, the basic essential events are yet to be discovered completely. Coordinated action of two genetic sources has been involved in biogenesis of efficient mitochondria i.e. mitochondrial and nuclear genome. In a nucleated somatic cell, entire mitochondrial DNA makes up to 0.5% of total DNA. Illustration of the entire human mtDNA sequence and cognition of its pathogenic mutations has made it easy and simple to appreciate the clinical implications of mtDNA mutations. Diabetes is a common and prominent manifestation of mtDNA mutation leading to impairment of Oxidative phosphorylation (OXPHOS). The most frequent diabetogenic heteroplasmic A3243G gene mutation is present on the MTTL1 gene encoding $tRNA^{(Leu)\ (UUR)}$. It is the major basis of DM of maternal heritage It is a major basis of maternally inherited diabetes mellitus associated with hearing defects– "Maternally Inherited Diabetes and Deafness (MIDD)". A point mutation A3243G in the $tRNA^{Leu(UUR)}$ gene is strongly associated with the development of Maternally Inherited T2D. Few Asian studies didn't show mitochondrial DNA mutation to be a main inducer of mitochondrial diabetes so other pathogenic factors responsible for T2D must be taken into account.

Keywords:

Diabetes Mellitus (DM), Maternally Inherited Diabetes & Deafness (MIDD), MTTL1 gene, mitochondrial DNA, $tRNA^{Leu(UUR)}$ gene

Type 2 diabetes is a growing hazard affecting whole communities all over the world. It is not far that this crippling disorder will capture most of the population both in developed and developing countries. Diabetes is a multifactorial syndrome and it has already affected roughly 10% of Western countries and Japanese population. Unfortunately, it's frequency is still on a rapid rise especially in Asian region where 36% population has already been targeted by this deadly evil.[1]

Most common factors attributing this Asian trend are increased body weight/BMI, less active life style and interplay of genetic and environmental factors. This rise in occurrence of diabetes is also associated with acute and chronic diabetic complications involving cardiovascular ailments and recurrent infections which are often debilitating and fatal [2]. Over a couple of years back, an interesting relationship between BMI and type 2 diabetes is observed and it was seen that unlike previous studies, type 2 diabetes is seen in young patients with low BMI.[3] Association of this interesting finding with genetic makeup of the patients has become a new focus for researchers for the last few years.[4]

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Same trend was observed in some Indian immigrants settled in South Africa[5]. More studies revealed that a big percentage of younger age group Indians residing in United Kingdom showed high incidence of type 2 diabetes as compared to other Britains.[6]

This trend of occurrence of type 2 diabetes in young lean subjects is expected to rise from171k to near 400k by the year 2030 [7].

Classification of diabetes mellitus:

Recommended classification by WHO study group of diabetes mellitus classifies diabetes mellitus as type 1 diabetes (T1D), T2D, gestational diabetes, malnutrition related and some other types of diabetes related to certain metabolic syndromes like pancreatic diseases,

diseases of hormonal etiology, etc.[8,9] Both T1D and T2D mellitus are heterogeneous syndromes which show involvement of numerous mechanisms of pathogenesis.[10] The important causative factors are autoimmune destruction of β cells (beta cells) in pancreas with T1D, whereas various genetic variations like genes for insulin synthesis, its secretion and peripheral insulin receptor genes mutations are some of the important causes of T2D.

Criteria for diagnosis of diabetes mellitus:

According to American Diabetes Association criterion, the diagnosis of diabetes mellitus is definite. Fasting blood glucose: > 7mmol/L and random blood glucose level > 11.1 mmol/L. Impaired glucose level is random blood glucose level from 7.8 to 11.0 mmol/L .[11]

Molecular Pathogenesis of T2D:

Researchers have explored different aspects of type 2 diabetes in past two to three decades and basic concept of pathophysiology of T2D has been revolutionized. Though it is still a myth, reaching to exact conclusion about exact pathophysiology of T2D at younger age groups is still an uphill task.[12] Now researchers are more focused to analyze and identify molecular and genetic elements behind this disaster. Much has been explored and much more is yet to be done.[13] One significant Japanese research in Japan[13] has revelealed that vulnerable subjects usually carry some genetic mutations in nuclear DNA predisposing them to reduced insulin sensitivity and impaired glucose utilization ultimately leading to the development of diabetes. Recent work on genetics showed that mitochondrial DNA mutations affecting mitochondrial oxidative phosphorylation are also involved in pathogenesis of T2D at younger age. [14]

Mitochondrial DNA:

Mitochondrion contains its own extra chromosomal DNA (mtDNA) - first demonstrated with help of electron microscopy by Nass and Nass in 1963.[15] The complete nucleotide sequence was established by Anderson in 1981 [16]. It measures 16569 base pairs (bp) in overall length. Among the two strands, heavy strand (H – Strand) is purine rich and light strand (L – Strand) is pyrimidine rich. The assigned words “Heavy” and “Light” refer to the variability in electrophoretic mobility of the DNA separated strands. Mitochondrial DNA is mostly double stranded with the exception of a small triple stranded part because of synthesis of an additional segment of mitochondrial DNA, 7S, which is called Displacement Loop. It lacks any coding DNA region. Each mitochondrion has about 2-10 DNA copies (Shay *et al,* 1990) [17]. Entire mitochondrial DNA content makes upto 0.5% of the total genomic DNA. In mitochondrial DNA, 93% is coding sequence.[19]

Human mtDNA consists of 37 genes, 13 out of these code for proteins of OXPHOS system. Rest of the 24 genes encode 22 transfer RNA (tRNAs), 2 ribosomal RNAs (rRNAs) i.e. 16S rRNA & 12S rRNA and 13 messenger RNAs (mRNAs). The rest of the proteins in OXPHOS system are encoded by nuclear genome. Respiratory Chain (RC) is mainly composed of approximately 100 polypeptides among which genes for 13 are present in mitochondrial DNA while the rest are encoded by nuclear genes.[17]

All the complexes of the RC, except complex II, have a double genetic origin. One to seven of the subunits are being encoded only by mitochondria.[18] Of the 37 genes, 28 are being encoded by the H-strand whereas only 08 tRNAs and 01 mRNA (ND6) are being coded by L-strand. Human mtDNA holds two promoter regions for transcription of RNA. Both are located in the D-Loop region having conserved sequence blocks. One of the promotors controls H-strand transcription, whereas the other controls transcription of L-strand.

The mitochondrial matrix also accommodates many indistinguishable copies of the mtDNA, mitochondrial ribosomes, tRNAs and distinct enzymes needed for mitochondrial genes expression.[19]

Mitochondrial DNA inheritance and copy number:

The mtDNA inheritance doesn't follow the well-known Mandelian pattern of nuclear genes inheritance and follows "Maternal Inheritance" only.[20] This exceptional inheritance pattern of mtDNA gives an indication of a mutation occuring in the maternal mtDNA, that will get transmitted to all the offsprings. Paternal mutant mtDNA is neither transmitted nor influences his children.[21] Moreover, unlike genomic DNA, at the time of cell division, each daughter cell gets half of the actual number of mitochondria, which are then duplicated to restore the actual number. Hence mtDNA is randomly distributed between two daughter cells and each cell contains different sets of mutant and correct copies of mtDNA. Hence a cell gets an abruptly abundant amount of the defective mtDNA, varying the age of onset and strength of the disease among these individuals. Moreover, a disease dominance is seen in one generation and absolute absence in the next generation.

mtDNA mutations get accumulated sequentially throughout maternal lineage and correct/altered mitochondrial DNA can exist together at the same time in a single cell. This coexistence of both types of mtDNA is called *heteroplasmy*. mtDNA heteroplasmy is important in the determination of the onset and clinical presentation of the mtT2D. Moreover, it permits an otherwise fatal variation to continue without producing drastic fatal effects.

mtDNA exposure to extempore mutations is times higher as compared to nuclear genome as it doesn't have histone protection and lacks the nucleotide excision repair system reducing mtDNA damage repair.[22]

In a standard condition, mtDNA molecules of an individual are identical (homoplasmy). Homoplasmy allows either a completely correct or a completely mutant mtDNA to be present at one time.[23]

Mitochondrial DNA mutations and diseases:

It is the contribution of Luft et al (1962) to prove that whenever mitochondrial DNA gets mutated, electron transport chain and ATP synthase complex gets defective, impairing ATP production and leading to development of many more disorders related to OXPHOS [24] ranging from muscle dystrophies to diabetes. [25]

Pathogenic mutations disrupting the OXPHOS system leading to the development of disease state is not the only reason responsible for mitochondrial diseases. Before the discovery of the first mtDNA mutation in 1988, several disorders were transitionally categorized as mitochondrial diseases on the basis of unusual morphological or biochemical hallmarks of mitochondria or its unique inheritance pattern.

The early proof of the role of mtDNA in the development of some diseases was given by two findings, detection of mtDNA deletion mutation in the mitochondrial myopathies and mtDNA mutations responsible for Leber's hereditary optic neuropathy. Later on, another mtDNA mutation responsible for mitochondrial encephalomyopathies was described.[26]

Whole collected data and untiring efforts of researchers to find out mitochondrial DNA mutations and occurrence of disease has helped all new coming researchers to further explore this field and contribute to provide information to clinicians and geneticists.

The causes of mitochondrial diseases can be deletions, duplications and point mutations, abolishing the functioning of these genes present in mitochondrial genome. The amount of mutant mtDNA needed to produce a clinically apparent mitochondrial disease is called *threshold effect*. It depends on the precise adjustment between energy provision and requirement of the tissues. It fluctuates among individuals, various systems and inside same tissue. [27]

The persons showing higher degree of heteroplasmy will develop more intense clinical symptoms at an early age, as compared to low heteroplasmy. Moreover, due to some reason, cells of the ear in the cochlear portion are found to be more prone towards energy deficiency. To conclude, in diabetics, whenever oxidative phosphorylation is disturbed leading to defective ATP production, hearing capabilities of the patient get impaired too, sometimes in extreme cases lead to, "Sensory-neural deafness". [28]

Mitochondrial tRNALeu(UUR) gene *A3243G* mutation in T2D:-

According to one study [28], approximately 978,000 carriers of A3243G mutations are present globally. Almost twenty mtDNA mutations have been identified and were found to be linked with diabetes inherited maternally such as homoplasmic mutations i.e G1888A, A4917G , T4216G,and T14709C. Out of the twenty mutations, A3242G mutation is continually recognized in 0.1-1.5% of the diabetics. [29]

It can safely be said that most of the mitochondrial DNA mutations lead to development of T2D at an early ag out of these, *A3243G* gene mutation is the most commonly detected mutation. Concerned gene location is MTTL1 which is responsible for generation of $tRNA^{(Leu)(UUR)}$.

A3243G gene mutation is a root cause of diabetes which is inherited maternally accompanied with impaired hearing, usually sensorineural in nature a condition called "Maternally Inherited Diabetes and Deafness (MIDD). [30]

Pancreatic cells are metabolically more effectual and hence more liable to get affected by any disruption in the OXPHOS system. Diabetes related to mtDNA mutations develops mostly due to defective insulin release by the beta cells, and not due to the insulin resistance. Numerous steps and processes take part in the exact release of insulin from the beta cells. GLUT-2 receptor are responsible for transports of glucose into the β cells, which gets phosphoryled by glucokinase and then oxidized aerobically. High ATP/ADP ratio thus leads to closing of potassium channels, cell membrane de-

polarization and thus opening of the voltage gated calcium channels. Calcium influx stimulates the release of insulin and regulates the quantity of Citric Acid cycle (TCA).[31]

It was postulated that mutations in mtDNA impair glucose oxidation and lactate formation. More lactate is reaching liver and, by gluconeogenesis, gets converted back to the glucose. Thus, leading to high blood glucose levels. But, according to consequential studies, two key factors were found to be implicated in diabetes inherited maternally, first one being acceleration of gluconeogenesis and the other one the defect primarily in the β cells of pancreas so that the capacity of the cells secreting insulin is decreased.[32]

A3243G gene mutation was first described in the patients who had presented with mitochondrial encephalomyopathy along with lactic acidosis with stroke like episodes (MELAS) but later on it was also found to be involved in MIDD. Patients suffering from maternally inherited diabetes usually present with the complaint of early onset i.e. at the age of ≤ 40 yrs., frequent failure in the therapy with oral hypoglycemic drugs and demand insulin therapy instead. *A3243G* mutation results in the loss of mitochondrial function in vivo. At some stage, this mutation also causes maternally inherited diabetes or MELAS in those subjects who carry this mutation and remain symptom free for a long time.[33]

The linkage of mtDNA tRNALeu(UUR) gene mutations with the development of numerous diseases has already been proved, but the exact pathogenic mechanisms are largely unrevealed.

Clinical aspects of T2D with *A3243G* mutation:

The clinical presentation of maternally inherited T2D linked with the *A3243G* mutation has been discussed comprehensively by Guillausseau et al. (2001) [34] and can be summarized as mitochondrial diabetes having following characteristics:

a. It accounts for 1–2% of diabetics with mitochondrial diabetes phenotype.

b. This type of diabetes is usually treated with Insulin, oral hypoglycemics like sulphonylureas, or simply by controlling dietary intake of carbohydrate.

c. Most of these patients have low or normal body mass index (BMI).

d. Show absence of autoimmune markers as identified in T1D and there is absence of anti – GAD (Glutamic Acid Carboxylase) antibodies in blood .[35]

e. Usually accompanied with sensorineural hearing defect with characteristic sloping audio graphic curve.

f. Later on cardiomyopathies and other neurological symptoms may be seen in individuals carrying A3243G mutation.

g. Rarely observed renal complications.30 Mitochondrial $tRNA^{Leu(UUR)}$ gene mutation causes defective generation of $tRNA^{(UUR)Leu}$, and ultimately improper translation Low level of $tRNA^{Leu(UUR)}$ is found in the diabetics due to its more degradation and less affinity for Leucyl– tRNA synthetase.[36]

***A3243G* mutation of $tRNA^{Leu(UUR)}$ gene in Asian population:**

Adequate research on the prevalence of *A3243G* mutation is still lacking in Asian countries. However, increasing prevalence of T2D in Asian countries cannot be over looked.[20] Few studies on Indian population and Asian minorities present in western countries have provided several ideas about the prevalence of *A3243G* mutation. sahu RP et al . (2007) carried out on observational cohort study on young patients with T2D and found mitochondrial *A3243G* mutation in one (~1%) subject.[37] However, according to two previous research studies on South Indian adult type 2 diabetics, this mutation was not detected. Similar studies in Pakistan [38, 39, 40], Poland [41], Argentina [42] and Javanese population [43] could not detect mtDNA *A3243G* mutation. In these studies mitochondrial DNA mutation was not found to be a main inducer of mitochondrial diabetes associated with other features of MIDD, so other pathogenic factors responsible for impaired hearing must be taken in to account. [44]

Reaching to a final conclusion is still not easy as the multifactorial disease is very complicated to study. Moreover, along with mitochondrial DNA the role of nuclear DNA cannot be overlooked as nuclear DNA is responsible for formation of mitochondrial OXPHOS chain components. Hence genetic cause may be present in nuclear or mitochondrial DNA or even both.[45] Moreover pure maternal inheritance of mitochondrial DNA and nuclear DNA from both parents may play their role in pathophysiology of T2D. Above all, each cell has multiple mtDNA copies leading to alterations in heteroplasmic scale among various tissues and organs including brain, skeletal muscles and most importantly pancreatic tissues. However white blood cell being the

most easily available source of DNA has decreased heteroplasmic level due to fast rate of multiplication. [46]

Unfortunately, researchers have to face main problem that whole mitochondrial genome is vulnerable to mutations which may lead to diabetes by affecting OXPHOS. This problem can be overcome by sequencing the total mtDNA exploring all genes.[47] A thorough knowledge about all genes and possible diabetogenic mutations will help clinicians to design appropriate preventive and therapeutic tools.

As far as heteroplasmy is concerned, it is lowest in leukocytes and highest in tissues showing mutations. Moreover leukocytic heteroplasmy shows 0.7% fall by each passing year. Whereas white blood cells are usually used for mtDNA extraction. In this scenario chance to detect mtDNA mutation is low. Ideally, pancreatic tissue sample must be taken by tissue biopsy which is considered inappropriate in routine clinical practice in diabetic clinics.[47]

Keeping in mind the worldwide growing rate of diabetes, researchers need to design appropriate cohort studies on large population samples for detection of more and more diabetogenic mutations. There must be designing of proper tools for the identification of diabetics with underlying genetic mutations. While designing such diagnostic tools certain features suggestive of mtDNA mutations must be considered like age of onset, deafness, its severity and audiometric results.

Due to unique inheritance of mtDNA and interaction of the environmental factors, detection and identification of the genes and mechanism responsible for the maternal transmission of T2D and deafness is difficult to describe. However, the journey to explore more genes involved in the development of hearing defects is going on, as several genes are yet to be identified. [48]

To conclude logically, mtDNA A3243G mutations are involved in in impaired OXPHOS which in turn causes diseases like T2D and deafness. But even at this stage due to versatility of diabetes it cannot be labelled as sole factor behind T2D especially in Asian population. It still requires more studies and screening of larger population samples along with development of tools to explore other possible mechanisms leading to T2D. Such tools must have capability to select those diabetics who should undergo genetic investigations.

Role of autoantibodies in pathogenesis of diabetes cannot be overlooked. Gene expression can also be of great help along with complete sequencing of mitochondrial genome. Moreover susceptible families can be studied for mtDNA gene mutation and deafness including both symptomatic and healthy individuals.

All those patients presented with diabetes, hearing loss and suspected to carry any kind of mtDNA mutation should undergo thorough genetic evaluation. Correlation of diabetes, type of hearing defect and other features of mitochondrial disease should be established. This should be followed by careful search for possible genetic component.

By establishing an explicit etiological diagnosis, it will become beneficial to the diabetics in relation to treatment, prognosis and also to provide information to their relatives. Knowledge about the genetic subgroups has even now enabled us to give appropriate management i.e. those with HNF –1α MODY are treated with sulfonylureas, and those having lipodystrophy syndromes treated with leptin and thiazolinediones.[49]

Association of type 2 diabetes with *A3245G* mutation in Mitochondrial $tRNA^{leu(UUR)}$ gene can only be confirmed by studying, identifying diabetics with phenotype of maternally inherited diabetes and possible mtDNA mutation.

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POLIO ERADICATION: CURRENT STATUS AND CHALLENGES IN PAKISTAN

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ABSTRACT

Poliomyelitis (Polio) is a debilitating illness and a preventable cause of mortality and morbidity. It affects mainly children and can be prevented by the proper use of vaccine. Global Polio Eradication Initiative was successful in eradicating this deadly illness globally except in three countries i.e. Afghanistan, Pakistan and Nigeria. A literature review was carried out to identify available studies relating to socioeconomic obstacles in eradication of polio in Pakistan. "Pubmed", "Science Direct", "Google Scholar" and "Cochrane Library", were the search engines utilized to review the literature. Present study discusses facts about socioeconomic barriers related to poor or failed vaccination among children in Pakistan against Polio. We suggest to raise basic awareness in people regarding polio vaccination and defensive approaches to overcome the major factors responsible for non-vaccination of children in Pakistan.

Keywords:

Polio, Polio and Pakistan, PEI (Polio Eradication Initiative), WHO and Polio, Polio cases, Polio Endemic Countries

INTRODUCTION

Polio is a disabling contagious infection spreading through Polio Virus that invades nervous system and causes muscle paralysis. Poor sanitary conditions lead to food and water contamination and spread of the disease.[1] Polio affects mainly children under five years of age. There is no cure available yet but disease can be controlled via vaccination. The vaccine has different subtypes, the first being the very famous" Salk Vaccine", discovered by Dr. Jonas Salk in 1955, which is an inactivated poliovirus vaccine. Others include Oral Polio Vaccine (OPV), OPVs can be, Monovalent (mOPV), Bivalent (bOPV) or Trivalent vaccine (tOPV).

HISTORY

Poliomyelitis (Polio) has been present in New York since several decades, with the first major outbreak in 1916. Owing to the deep fear of this disease, the epidemic prevented public meetings at that time.[2]

In 1988, Polio Eradication Initiative (PEI) was launched by WHO. Polio virus infects more than 350,000 individuals in 125 endemic states.[3] The effectiveness of this effort is evident by the fact that in 1994, WHO region of Americas was reported as polio-free followed by the WHO region of West Pacific in 2000 and WHO region of European in 2002.[4] Unfortunately Afghanistan, Pakistan and Nigeria are still fighting against this infectious disease.

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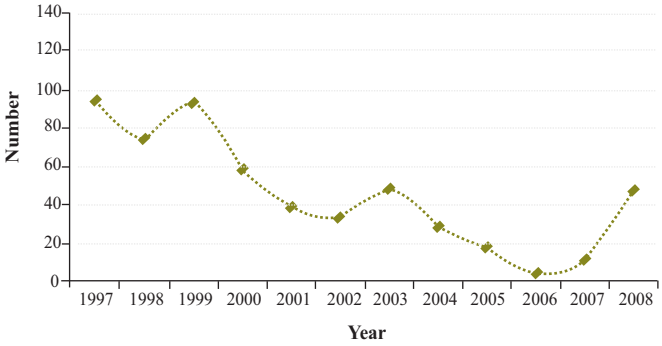

Figure 1: Number of districts with confirmed cases of polio in Pakistan, 1997-2008

In 1994, PEI was launched in Pakistan.[5] Initially, the outcome of this initiative was quite effective, with the number of cases falling from 1155 in 1997 to 28 in 2005.[6] However, from 2007 onwards; the number of polio cases started to rise; about 128 in 2011 and 306 in 2014. The number reduced to eight cases in 2017 with a rise again in 2019 to 144 cases. The number of cases had already reached seventeen in March 2020. The factors responsible for this resurgence are multiple and

multifocal. The main aim of this article is to focus on these hindrances that has led to failure of polio eradication in Pakistan and provide recommendations to overcome it.

The chart below shows the number of polio cases among different provinces of Pakistan from 2015 to 2020.

Table I: Wild polio cases across provinces of Pakistan

Province	2015	2016	2017	2018	2019	2020
Punjab	2	0	1	0	10	0
Sindh	12	8	2	1	30	5
KPK	33	10	1	8	92	10
Balochistan	7	2	3	3	12	2
Gilgit	0	0	1	0	0	0
AJK	0	0	0	0	0	0
Total	54	20	8	12	144	17

Source: (National Emergency Operation Centre)[5]

METHODOLOGY

Articles were searched using search engines of "Pub med"," Google scholar", "Science direct", and "Cochrane library" by employing the terms "Polio"," Polio and Pakistan", "WHO and Polio"," Polio Eradication Initiative (PEI)"," PEI and Pakistan". In order to find articles related to targeted study, the reference list of selected articles was systematically reviewed. During the exploration, no time limit was imposed. A total of thirteen articles were selected after carefully reviewing and two of them were excluded. All search results, including published original articles and English-language reviews, are considered.

LACK OF VACCINATION

After thorough literature review, the core reason of the persistence in polio cases was the failure of vaccination which is mainly due to incomplete vaccination or complete lack of vaccination. In Pakistan, there is approximately 75% coverage of vaccination done in year 2011[7] whereas, there were 33.1 million children who were vaccinated in year 2013 and about 2.34 million cases were considered as missing. In year 2014, WHO-UNICEF survey revealed that there is about 66% of immunization coverage across country.[8] The similar statistics were observed in a study conducted in Peshawar showing that there is about 64.2% children from both rural and urban areas who were fully immunized.[9] Since year 2000, Pakistan has initiated the efforts regarding the polio supplementary immunization activities (SIAs). For this, an idea of door to door home delivery of vaccination has been initiated because the situation was so alarming that it is in fact threatening the global polio eradication efforts.[10]

FACTORS AFFECTING PARTIAL VACCINATION

In Pakistan, there were many factors identified as obstacles in completion of vaccination. These factors have been classified into three major categories i.e factors which are mainly associated with population demographics, factors which are pertaining to the knowledge of caretaker and factors which are related to organization and implementation of mass campaign.[11]

a. Socioeconomic factors

The success of the immunization programs depends mainly on the socioeconomic factors. Similar outcomes were noticed by Mohammad A. (2014), in a case-control study. He found out that poor knowledge about vaccination and illiteracy of the heads of the family, were the major factors[12]. Poverty, unawareness and illiteracy lead to a vicious circle responsible for non-vaccination in nearly all the endemic areas[13]. A cross-sectional study done by Mohammad K. (2012), in Peshawar, depicted a range of detrimental socioeconomic factors including low educational status of parents, taking vaccination as an unnecessary activity, religious as well as cultural beliefs and social norms[14].

b. Illiteracy of caretakers

Although father`s education and employment played an imperative function but mother`s education seemed mandatory in this regard[15].

c. Lack of resources

A study conducted in Sub-Saharan Africa showed that vaccination coverage was clearly affected by mass media campaigns[16]. Similar results were found in a study from Ethiopia that unavailability of mass media was a factor responsible for non-vaccination of children in rural areas[17]. Long distances of the polio vaccination sites from the houses, unawareness about the campaigns and poor availability of mass media were the factors depicted in a survey in rural areas of Pakistan.

CONCLUSION

Poliomyelitis, a disease that leads to morbidity and preventable mortality in children, is still endemic in Pakistan. The world cannot be declared polio free until a single case of polio is present in any part of the globe. Pakistan, unfortunately, is harboring the major burden of the disease and although reasons of this persistence are multifocal, the major one is the socioeconomic factors.

In order to overcome these factors, a joint approach of the government and community is required. Local community centers and health centers could be a great source of knowledge and education of parents especially mothers regarding proper vaccination.

WHO facts showed that more than 18 million people are able to walk today who would have been paralyzed otherwise. Around 1.5 million childhood deaths have been prevented since, through the systematic administration of immunization.

The literature review above suggests that there is a wide gap in knowledge from the quantitative synthesis of evidence regarding the responsible factors to persistence of polio in Pakistan. Although a fair amount of data is there in the form of qualitative or mixed- method studies but the number of prospective studies is limited. So, it is significant that further detailed studies and focal group discussion should be conducted in this field as well.

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CASE REPORT

OGILVIE SYNDROME WITH CECAL PERFORATION AFTER CAESAREAN SECTION

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ABSTRACT

Ogilvie syndrome (OS) or acute colonic pseudo-obstruction (ACPO) is a condition characterized by clinical and radiological features of colonic obstruction in the absence of any mechanical cause. Colonic pseudo-obstruction after a C-section is uncommon and perforation of cecum in such a case is rare. We present a case of a patient presenting with abdominal pain and distension after Caesarean section with the operative findings of perforation of cecum. Patient was managed with an open cecostomy that required an open closure after three months. Open cecostomy is an option when the defect in cecum is large after excision of its gangrenous part.

Keywords:

Acute colonic pseudo-obstruction; Caesarean section; Cecal perforation; Ogilvie syndrome; Open cecostomy

INTRODUCTION

Ogilvie syndrome was first described in the medical literature in 1948 by a British surgeon named Sir William Ogilvie.[1] This disorder is also known as acute colonic pseudo-obstruction. It is distinct from chronic intestinal pseudo-obstruction, a similar disorder with different presentation. Ogilvie Syndrome (OS) is a rare acquired clinical condition which is characterized by massive dilatation of the colon associated with abdominal pain and distension but without any evidence of mechanical obstruction.[1] The causes are multifactorial with the most common being trauma, recent surgery (abdominal, urologic, gynecologic, orthopedic, cardiac, or neurologic), serious infection, cardiac disease, electrolyte imbalances, medications, severe constipation and hypothyroidism.[2] The exact cause of the disease remains unclear to date but most theories suggest an imbalance of a decreased parasympathetic and increased sympathetic tone or a combination of both.[2] The patients most commonly present with abdominal pain, distension, nausea, vomiting and constipation. It usually develops over a few days but some may present with rapid deterioration over a period of 24 hours. An additional finding of fever and peritoneal signs is seen in patients with ischemic or perforated bowel. Physical findings mostly include abdominal distension, abdominal tenderness, absent or hyperactive bowel sounds and an empty rectum on digital rectal examination.[3]

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Here we present a case that developed Ogilvie syndrome a few days after caesarean section surgery. She presented with acute peritonitis because of rare complication of cecal perforation.

CASE REPORT

A 20 year old female with her third pregnancy, underwent an elective Caesarean section at 38 weeks of gestation, in a private hospital. She was discharged on second postoperative day. On third postoperative day she started developing abdominal distension. Two days after that she had an episode of vomiting and also complained of absolute constipation. One week after surgery, she was referred to our hospital with abdominal distension, absolute constipation and decreased urinary output for previous two days. There was no history of vomiting, nausea or fever. On examination, her pulse was 140 bpm, BP was 90/50 mmHg, temperature was 101°F and respiratory rate was 22/min. Examination showed a distended abdomen with mild generalized tenderness and absent bowel sounds. Digital rectal examination revealed an empty rectum. Her clinical signs and symptoms

pointed to a diagnosis of acute peritonitis.

The patient was placed nil per orum. Nasogastric tube was passed and it yielded copious aspirate. Only 50 ml of urine was obtained in Foley catheter. Aggressive fluid therapy and intravenous antibiotics were started. Chest X-ray showed massive pneumoperitoneum with blunting of costophrenic angles(Fig 1). Plain X-ray abdomen (Fig 2) showed dilatated ascending colon loaded with fecal material. Dilated cecum was seen displaced medially due to free peritoneal air. Laboratory investigations were within normal limits. Based on her history, examination findings and radiological signs, Ogilvie syndrome with perforation of cecum was suspected.

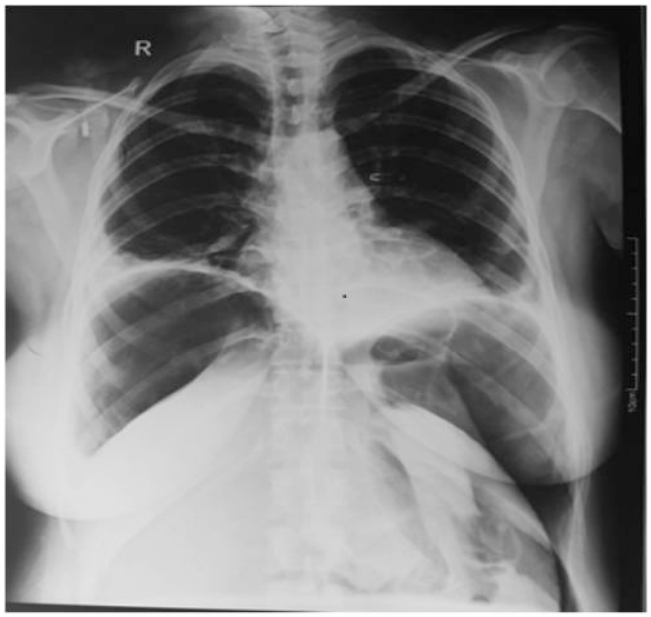

Figure 1: Chest x-ray PA view

Figure 2: Plain x-ray abdomen showing dilated cecum

Figure 3: Distal barium loopogram before closure of cecostomy

An emergency exploratory laparotomy was carried out. There was generalized fecal peritoneal soiling. Cecum and ascending colon upto the hepatic flexure were found to be massively dilated. Cecal diameter was about 16 cms, with two 2.5 cm gangrenous and perforated patches on its anterior wall. Thorough peritoneal lavage was done with 0.9% saline. Necrotic patches were excised. This large defect in the cecum was not sutured because of intraperitoneal sepsis and instead it was brought out as a cecostomy. Post-operatively, the patient was nursed in ICU for 2 days and managed with intravenous fluids, antibiotics, analgesics and nutritional support. She was discharged on 5th post-operative day.

The cecostomy continued functioning and an open closure of cecostomy was performed after three months after confirming patency of distal bowel by a barium loopogram (Fig 3). Patient started passing stools on third postoperative day and was discharged on fifth postoperative day.

DISCUSSION

Ogilvie Syndrome (OS) or acute colonic pseudo-obstruction (ACPO) is the presence of colonic dilatation and features of intestinal obstruction in the absence of any mechanical cause. Mechanical obstruction usually refers to any lesion that physically blocks the passage in

the colon. The most probable cause of OS has been attributed to recent surgery, other causes being infection, trauma, electrolyte disturbances, cardiac disease and various medications.[2] The pathophysiology includes disturbances in the autonomic nervous system with the imbalance between parasympathetic and sympathetic systems mainly responsible for contributing to the etiology.[4]

Cecum is the most common site of perforation in OS because of its large diameter. In the presence of a functional ileocecal valve, the colonic contents cannot spill over into the ileum. Therefore, any increase in pressure in the large gut causes the cecum to dilate. According to Laplace's law, the intraluminal pressure required to stretch the wall is inversely proportional to the diameter. Because of its large diameter, cecum is more prone to ischemia and subsequent perforation.[5] Cecal perforation is the most serious complication of OS as its mortality rate can be up to 36- 44%.[6] Fortunately the incidence of cecal perforation is only 1% to 3%.[7] The diameter of cecum is an important parameter to assess the perforation. General consensus nowadays is that, a diameter of 9 to 12 cm should be managed conservatively. However, a cecal diameter of more than 12 cm is at a high risk of perforation, reported in up to 23% of patients.[4]

The diagnosis is based on history, clinical presentation and imaging. Laboratory investigations provide little information, particularly in a patient who has undergone surgery recently. Plain abdominal radiography may show dilatation of mainly the ascending colon that may extend up to splenic flexure. In the presence of perforation, air may be seen under the diaphragm. Air fluid levels may or may not be present. Contrast enemas can also be used if the diagnosis cannot be confirmed.[8] Colonoscopy can serve both as a diagnostic and therapeutic tool. It can differentiate ACPO from mechanical obstruction and relieves the pressure in the dilated bowel.[9]

Treatment depends upon the presence or absence of bowel ischemia and perforation. If there is no evidence of ischemia, and the cecal diameter is less than 12cm, conservative management should be tried. Bowel is rested, aggressive fluid therapy is started, nasogastric decompression is done, and any electrolyte imbalance is corrected. Intravenous antibiotics may be started as a prophylactic measure. The patient is closely monitored for any signs of peritonitis and serial radiographs are obtained to measure cecal diameter. Conservative management may be employed for 48 to 72 hours and successful resolution has been reported in 83-96 % of patients.[10]

Medical management with neostigmine has been reported to be very successful in recent studies.[10] It is a cholinesterase inhibitor and helps in increasing bowel motility. A dose of 2mg of diluted neostigmine may be given and repeated after 12 to 24 hours. Good outcome has been reported by some studies that were done using a sympathetic blocker, guanethedine, followed by a cholinesterase inhibitor, neostigmine.[11]

Endoscopic decompression has been reported to be superior to neostigmine therapy in recent studies.[12] A temporary decompression tube may be guided by the scope into proximal colon for continued decompression.

Percutaneous tube cecostomy is reserved for patients who do not respond to conservative means. Although criticized for complications like wound infection, cecal fistula, and intraperitoneal leakage, it remains an advantageous option as it successfully decompresses the large bowel and can be performed on the bedside in critically ill patients.[4,11]

Surgical intervention with an exploratory laparotomy should be done in a patient with signs of bowel ischemia and perforation. The surgery may entail a tube cecostomy, an open cecostomy, right hemicolectomy or proctocolectomy; depending upon the operative findings.[11] Surgery is also the last resort in those patients who have failed to respond to conservative therapy or colonoscopic decompression.

CONCLUSION

Ogilvie Syndrome (OS) must be suspected in unexplained abdominal distension in a postoperative case. Radiography is the best diagnostic tool. Colonoscopic decompression and medical management can be successful in most cases but repeated evaluation should be done for bowel ischemia and perforation. Surgical intervention is done in patients with signs of bowel ischemia and perforation. Open cecostomy is an option after removal of a gangrenous patch of cecum in severely sick patient.

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