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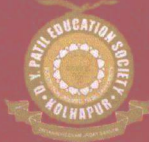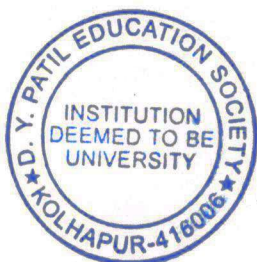## [Deemed to be University], Kolhapur
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ICMR-STS Projects

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ICMR-STS-Approved Projects

Sr. No.	Name of Student	ICMR-STS-Project Title	Name of Guide	Status	Year
1	Pradipti Kothiyal	Assessment and knowledge regarding management of snake bite cases among primary health care providers in Kolhapur district, Maharashtra	Dr. Pratapsingh Rathod Dept. of FMT	Submitted- result awaited	2022
2	Shetty Shravya	Awareness, analysis and Comparison of Knowledge of Breast Self-Examination in young girls for Early Diagnosis	Dr. Anita Gune Dept. of Anatomy	Publication **International Journal of Scientific Research ISSN- 2277-8179**	2022
3	Shubham Gupta	Effect of Colours on Perception and Cognition of students belonging to two different age groups : A cross sectional Study	Dr. Anita Gune Dept. of Anatomy	Publication **Journal of clinical & diagnostic research ISSN- 0973-709X**	2021
4	Hemanshi Shirohi	Impact of Household poisons awareness program on knowledge and attitude among primary school children in urban Maharashtra	Dr. Pratapsingh Rathod Dept. of FMT	Accepted proposal In process	2019
5	Himanshi Sharma	Assessment of occupational health hazards and exposure to pesticides among florists through handling of flowers	Dr. Ashutosh Potdar Dept. of FMT	Accepted proposal In process	2019
6	Indireddy Sindhuri	Bacterial Contamination of White Coat Among Medical Personnel- A cross sectional Study in Kolhapur, INDIA	Dr. Roma Chougule	**Journal of Pure and Applied Microbiology Print ISSN: 0973-7510**	2018
7	Dharampal	Diabetic Otopathy	Dr. R. S. Mane Dept. of ENT	Publication **Bengal Journal of Otorhinilogy and Head Neck Surgery 2395-393 (print), 2395-2407 (online)**	2018
8	Satpal	Analysis of Impacted Ear Cerumen and its significance in hearing loss among School going children	Dr. Varute Dept. of ENT	-No Publication	2018

Dr V. V. Bhosale
Registrar,
D. Y. PATIL EDUCATION SOCIETY
(Institution Deemed to be University)
869, 'E', Kasaba Bawada
KOLHAPUR - 416006

Pradiph
Kathiyal

Reference ID: 2022-03776

Title: Assessment of Knowledge regarding management of snake bite cases among primary health care providers in Kolhapur District, Maharashtra.

Introduction:

Snake bite is an injury caused by the bite of a snake may be venomous or non-venomous snake. Hands, arms, legs are the most common sites involved. It is predominantly a rural problem and it is largely an occupational disease of farmers, fisherman, military personnel, people living in hilly region and near forest. Reasons behind the high morbidity and mortality is the misconception about snakes and snake-bite, lack of knowledge and awareness, strong belief in traditional healing methods and connectivity issues. But it has been noted that health care providers though being the first person to treat the problem are also lacking adequate knowledge, training about management of snake bite and rational use of Anti-Snake Venom (ASV) which also results into complications and death[1]. As per Times of India, many cases go unreported as people opt for traditional methods[2]. Plenty of ASVs are available in District Hospitals and Primary Health Centers but the right training and lack of knowledge about need of ASV, dose calculations, signs of envenoming results in high cases of death due to snake bite. Globally 1.2 to 5.5 million of snake bites are estimated annually[3]. In June 2017 snake-bite is added to WHO's list of neglected tropical diseases[4]. Maharashtra tops with 42,026 cases of snake bites in 2018-19 among which Kolhapur recorded 2298 cases[5].

Objectives:

1. To assess the knowledge to differentiate between venomous snake and non-venomous snake among Primary Health Care providers of Kolhapur District.
2. To assess the knowledge of identifying venomous snake bite among Primary Health Care providers of Kolhapur District.
3. To assess the knowledge of health care providers with regards to first aid and management of snake bite.

Methodology:

The study will be conducted over a period of 2 months recruiting primary health care providers in Kolhapur district, Maharashtra.

Study design: It is a cross-sectional study and data will be collected through a questionnaire administered by investigator.

Study Setting and Study Population: The study will be conducted including Primary health care providers mainly the Multi-purpose Workers (MPW's) working in the Primary Health Centres (PHC's) of Kolhapur district. There are 74 PHC's in Kolhapur district and each PHC's have 5 to 6 Sub-centres based on population. Each sub-centre has one Male MPW and one female MPW hence there are 722 MPW's working in all the PHC's in Kolhapur district. So, all the 722 MPW's will be include in the study on voluntary basis after obtaining Informed consent.

Data Collection: Data collection will be done by person-to-person interview using pre validated questionnaires. The questionnaires will be in 4 parts, Part one includes demographic data of MPW's like name, age, sex, years of experience etc. Second part will include questions regarding knowledge of differentiating between venomous snake and non-venomous snake. Third part will include knowledge about clinical features of venomous snake bite. Fourth part will include questions regarding first-aid and management of snake-bite.

Data analysis: data collected will be entered in MS excel worksheet and will be analyed using SPSS version 20.0. Chi-square and will used to study the association among the study variables.

Ethical Clearance: Study participants i.e., MPW's will be informed well about study protocol in vernacular language and their informed consent will be obtained before the study. Confidentiality and anonymity of the participants will be maintained throughout the study process. Participation in the study will be entirely on voluntary basis and without causing any harm to the participants. Study will be started only after obtaining ethical clearance from Institutional Ethics Committee.

Implications:

Number of snake bite cases are higher in the rural areas and primary health care providers such as MPW's are the first to be contacted by the victims of snake bite. Considering this scenario, the knowledge of MPW's about snakes, clinical features of snake envenomation, first-aid as well as management of snake bite plays crucial role in saving the lives of victims of snake bite. The present study will generate the data about knowledge of this health care workers about snake bite and based on this data health education will be imparted to the primary health care providers.

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INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

AWARENESS, ANALYSIS AND COMPARISON OF KNOWLEDGE OF BREAST SELF-EXAMINATION IN YOUNG GIRLS FOR EARLY DIAGNOSIS.

Anatomy

Ms. Shetty Shravya S — 3rd Year MBBS, D.Y Patil Medical College, Kolhapur.

Dr. Gune Anita R* — M.S Anatomy, Associate Professor, Anatomy, D.Y. Patil Medical College, Kolhapur. *Corresponding Author

ABSTRACT

Breast self-examination is a non-invasive monthly practise in which a person evaluates a normal breast and identifies any changes on the breast in order to seek early medical attention. The study's objectives were to analyse awareness of self-examination of breast, examine the difference in knowledge about self-examination of breast in medical student's vs non-medical students, and ultimately to promote awareness of correct self-breast examination method. A prospective questionnaire-based study was conducted on 300 female students from medical college and engineering college. After pre-event questionnaire the awareness session on Breast Self-Examination, was held with the assistance of a Power-Point Presentation was conducted. After the session, post-session questionnaire was collected. The questionnaire was used to assess post-event knowledge and attitudes about breast self-examination. Comparison of data collected from questionnaire Pre-Session and Post-Session was done, by comparing between Medical and Engineering students. For comparing the effectiveness in knowledge between the Medical and Engineering students unpaired t test was applied with the confidential level of 95%, P value less than 0.045 was significant. We observed that engineering students gained greater knowledge than medical students. To conclude awareness created among young professional students, which in turn will educate and spread knowledge to a large number of individuals in society. The purpose of this study was to dispel misconceptions and encourage proper self-breast evaluation methods.

KEYWORDS

Breast self-examination, Breast Cancer, Early Detection, women.

INTRODUCTION

Breast cancer is the most common cancer occurring amongst women worldwide. [1,2] Risk factors include being over 35 years old, having a family history of breast cancer and having a personal history. [3,4] Early diagnosis of Breast Cancer aids in quick access to care and decreased morbidity with the disease. [5,6] Breast self-examination (BSE) is important in early detection of breast cancer. [6] Mammography may not be available in majority of health institutions in most nations due to financial constraints. [7,8,9] Women should be encouraged to seek medical advice if they detect any change in their breasts. [10,11,12]

SUBJECTS AND METHODS
Design- Prospective, questionnaire-based study.

Sample size -
There were total 300 female students.150 students from medical college and 150 from engineering college

Inclusion criteria-
Willing current Female Students of age between 18-25years of medical College and engineering college were included.

Exclusion criteria-
Any students not willing or had any history of operation of mammary gland were excluded.

Data Collection:
A Prospective Questionnaire based study was done on female students from April 2021 to June 2021 after taking the consent to analyse their knowledge, behaviour, and attitudes regarding BSE.

For this study, a questionnaire was created using Google Forms internet survey based on questionnaires used in prior studies in Egypt (Boulos and Ghali, 2014)[13] and Iran (Reisi M, 2014)[14] University of Beau (Nde FP, Assob JC.,2015)[15] North-East London (Forbes et al., 2010)[16] and Turkey (Karayurt et al., 2008)[17]

Data was gathered from professional colleges, medical students as well as engineering students. This assured that student from a wide range of professions came to participate in our research, eliminating the possibility of selection bias.

All female participants who volunteered and gave consent to take part in the study were included in the target population. Participation in the study was entirely voluntary. The study's purpose was communicated to each participant, and informed Consent was obtained.

Confidentiality was ensured to the respondents. The Questionnaire had 27 questions categorized in 5 sections. (Questionnaire attached) After consenting the form they were asked to fill the 5 questions which contained participants' basic information, such as their name, age, field of study, year of study, and college name, as well as their informed consent. The second and third sections each had 4-5 questions about sociodemographic characteristics and knowledge, with one extra question to assess the students' source of awareness, while the fourth section had 12 questions about breast self-examination practice and 6 questions about attitudes toward breast self-examination. The survey measured participants' understanding (for example, "BSE is used to detect lumps in the breast"), how often BSE should be conducted, and when BSE should be performed. Furthermore, this section looked at whether participants did BSE, why they didn't do BSE, how often they did BSE, and if they were comfortable in identifying changes in their breasts.

The questionnaire was validated by an associate professor of community medicine after which required changes were made to the questionnaire. Reliability of the questionnaire was tested by conducting a study on 20 Female Students from other professional colleges. (Dental and law students)

Participation in this study was completely voluntary, and all students who decided to participate granted their consent using an online survey platform-Google-Form. Participants were given detailed description of the study's aim. They were assured that their participation would be completely anonymous and that no personally identifiable information would be gathered.

The study was conducted after obtaining the ethical clearance from the institute. (Ethical clearance attached). Permission to conduct the study was granted from the Dean of Medical college and Principal of Engineering college. (Due to the present Covid-Pandemic, the study was done online. The link to join the group was provided to the participants using an internet platform called WhatsApp. Medical and engineering students were split into separate groups. A pre-event questionnaire in Google form version was circulated before the awareness session, and we asked all willing participants to complete the forms. Following the collection of 150 answers, an awareness session, as well as a demonstration session on Breast Self-Examination, was held on an online platform-Zoom with the assistance of a Power-Point Presentation and the supervision of a gynaecologist. (Guide). Because the event was held online due to covid, a video demonstrating the proper method for breast self-examination was shown, which helped the participants comprehend

and learn better. After the post awareness session on Breast Self-Examination, many participants put forth their queries which were attended and discussed in the end. Few of the participants gave positive verbal feedback about presentation, video and interactive session. After the session, we circulated a post-session questionnaire in the form of a Google form and recorded the replies of the participants. The same questionnaire was used to assess post-event knowledge and attitudes about breast self-examination. The session was beneficial for raising awareness about breast self-examination as a useful tool for early breast cancer detection.

Data Analysis:

The Statistical analysis from the data collected from questionnaire was done by software SPSS-23.0 version for comparing between Pre-Session and Post-Session in Medical and Engineering students. Few questions from the questionnaire having yes or no were coded as 0,1. These questions were in Section A Question No 1, Section B Question No 5,6,9, Section C, Question No 12,13,14,16,21,22,23,24, Section D, Question No 25,26,27,28. Paired t test was applied with the confidential level of 95%, P value less than 0.05 significant. For comparing the gain in knowledge between the Medical and Engineering students unpaired t test was applied with the confidential level of 95%, P value less than 0.045 was significant. Remaining questions with multiple options percentages were calculated as shown in graphs.

RESULTS

From the total 300 calculated sample size, all participated taking attendance rate to 100%. Table 1 depicts response from medical students. On Analysis of Section A which consists questions on Sociodemographic Characteristics (family history of breast cancer) the data showed significant P value of 0.045 as shown in table 1. In this study majority of participants from medical college had no family history of breast cancer 95.7%.

Table 1

Medical students	Pre session Mean± SD	Post session Mean± SD	P VALUE
Section A: sociodemographic characteristics	0.97±0.16	1 ±0	0.045*
Section B: knowledge of breast cancer and breast cancer prevention	2.31±0.78	2.91 ±0.28	P<0.0001**
Section C: knowledge and practice of self-breast examination	5.99± 1.48	7.48±0.80	P<0.0001**
Section D: attitude based	4.66±0.64	5.92 ±0.26	P<0.0001**

Among the responses received, almost half of the respondents were sensitized about breast Self-Examination 79.3% amongst which mass media 46.7% contributed a major portion followed by books for medical students. (Figure 1) On Analysis of Section B which consists questions on knowledge of breast cancer and breast cancer prevention including Question No 5, 6, 9 in Medical Students, the session was significantly useful with P value less than 0.0001 as shown in Table 1. Moreover, most of respondents 89.1% students knew that BSE is a useful tool for early detection of breast cancer. Amongst the total responses, less than half of the participants from medical college 35.9% have been taught the appropriate method of BSE. On Analysing, Section C which consists questions on knowledge and practice of self-breast examination including Question No. 12,13,14,16,21,22,23,24 in Medical Students, 42.4% practice BSE. 52.2% state that BSE should be done monthly while 10.9% respondents stated that it should be done weekly, according to the medical students 81.5% say that BSE should be done by the individual and 14.1% should be done by a doctor. 73.9% of students have heard about mammography and 69.9% students responded that it is a useful tool for early detection of Breast cancer. The session was significantly useful with P value less than 0.0001 as shown in Table 1. Moreover, 57.6% practice BSE out of which 37% respondents practice rarely and 51.8% monthly. 51.1% stated that BSE helps in clinical detection of abnormality in breast. Pre-session responses from students suggested that 57.7% lump may be an early sign for cancer.

In this study, On Analysis of Section D which consists questions on Attitude and behaviour on Breast Self-examination including Question No 25,26,27,28 in Medical Students, out of 150 responses,

5.4% respondents were not confident while performing BSE as recorded in pre-session event while in the post session response there is a slight improvement in responses.95.7% students in the pre session stated that they feel uncomfortable while performing BSE while in the post session the outcome was positive. There was a significant gain in knowledge and change in attitude towards it after the session as analysed by Post session questionnaire.

Table 2

Engineering students	Pre session Mean± SD	Post session Mean± SD	P VALUE
Section A: sociodemographic characteristics	0.90±0.30	1 ±0.00	P<0.0001**
Section B: knowledge of breast cancer and breast cancer prevention	1.32 ± 1.12	2.46 ±0.7	P<0.0001**
Section C: knowledge and practice of self-breast examination	3.62 ± 1.6	5.87 ± 1.75	P<0.0001**
Section D: attitude based	4.97± 1.26	5.78 ±0.61	P<0.0001**

In this study, a total of 150 response was recorded from the Engineering students. The findings showed that there was less sensitization among the engineering students. On Comparing Pre and Post Sessions response of Engineering Students in Section A Question No 1, Analysis on sociodemographic characters were made. 88.7% students have heard about breast cancer and the source of information was maximally through Media (Figure 1), the P value was less than 0.0001 which was significant as shown in Table 2.

On Comparing Pre and Post Sessions response of Engineering Students in Section B Question No 5, 6, 9, the P value was less than 0.0001 which was significant as shown in Table 2. Almost 40.2% of students have not heard about Breast Self-Examination. 60% respondents were not taught about the appropriate method of Breast Self-Examination. According to the response recorded 73.3% stated that BSE should be started after 20 Years in Pre-Session questionnaire whereas the post session questionnaire concluded that there was a positive impact.

On Comparing Pre and Post Sessions response of Engineering Students in Section C Question No 12,13,14,16,21,22,23, the P value was less than 0.0001 which was significant as shown in Table 2. According to the results only 66.7% respondents knew that BSE should be done by the individual. 20% reported that it should be done by the doctor. Out of the 150 respondents surveyed, 60% of the respondents felt that BSE should be done by feeling the breast with the hand in the pre-session while in the post session there was an increase in knowledge by 15%. 66.7% respondents have heard about mammography out of which 33.3% respondents agreed that mammography is a useful tool for early detection of breast cancer. In the Post-session there was a significant impact in knowledge and 78.2% respondents knew that mammography is a useful tool for early detection of breast cancer.

In this study, On Comparing Pre and Post Sessions response of Engineering Students in Section D which consists of Attitude based questions Question No 25,26,27,28, the P value was less than 0.0001 which was significant as shown in Table 2. The results show that nearly 20% students feel funny, uncomfortable and embarrassing while performing BSE before the awareness session. The post session questionnaire revealed a positive attitude towards practicing BSE. 98% respondents did not feel funny, uncomfortable or embarrassing while performing BSE. The willingness to create awareness significantly increased after the session. The post session results revealed a positive gain in response stating 100% response in terms to create awareness about Breast Self-examination in the society.

Hence, the session created awareness on knowledge, practice and change in attitude on Breast self-examination in engineering students.

Table 3 Comparison Between Medical And Engineering Students

Average gain in medical and engineering students	Medical Students Mean± SD gain	Engineering Students Mean± SD gain	P value

Section B: knowledge of breast cancer and breast cancer prevention	0.6±0.77	1.14 ±1.08	P<0.0001**
Section C: knowledge and practice of self-breast examination	1.5 ± 1.44	2.25 ± 2.03	P=0.0002**
Section D: attitude based	1.26 ± 0.70	0.80± 1.18	P<0.0001**

On comparison of the knowledge gained by medical and engineering students, section B question No 5, 6, 9 definitely showed more Knowledge was gained in engineering students as compared to medical students as shown in table 3. There was highly significant gain in both Medical and Engineering students, due to the awareness session. Similarly, in Section C Question No 12,13,14,16,21,22,23, there was significant difference in knowledge perceived between Engineering Students as compared to medical Students.

On comparing section D-Attitude based Question No 25,26,27,28, there was a significant difference, it was more in Medical Students as compared to Engineering Students.
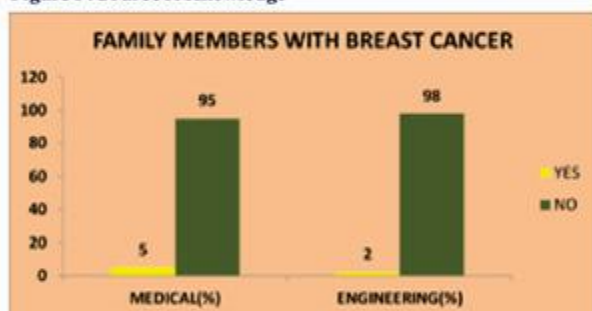

Figure 1 : Source of Knowledge

Figure 2: Family members with Breast cancer

DISCUSSION:

According to our findings, more than half of the study population 50.2 % were not aware of Breast Self-Examination. 75% of the research participants did not perform breast self-examinations on a regular basis. However, there was a considerable improvement in knowledge, practise, and attitude change that was reported following the awareness session. Ngua et al.,[18] it was found that the training and awareness session on Breast Self-Examination had no effect. Taşhan ST et al. reported in their study that the training offered had a short-term influence on the women's behaviour, with the effect being mostly related to breast self-examination.[19] In the current study, there was an increase in knowledge and a positive shift in attitude regarding Breast Self-Examination in the post-session over the pre-session. The knowledge and practise rate of Breast Self-Examination was higher in medical students than in engineering students in the pre-session response, but the gain in knowledge was greater in engineering students in the post-session response than in medical students because medical students were already aware of and were taught the proper method of Breast Self-Examination. BSE appears to be preventive (reduction in Breast Cancer mortality) at all ages, according to cohort research in Finland and a case-control study in Canada. There has recently been discussion on the significance of frequent breast self-examination in avoiding breast cancer mortality. The education of BSE, on the other hand, can make women aware of any abnormal changes in their breasts and seek medical care as soon as possible. As rightly quoted at the proceedings of the international consensus conference "Positive health-care behaviour can go a long way toward raising public health awareness and health-seeking behaviour".[20,21]

According to Champion and Miller, sociodemographic characteristics can impact attitudinal variables, which can then influence behavioural patterns indirectly. There are various direct links between experimental and demographic characteristics as well as potential indirect links to BSE behaviour [22] The only important variable in this study was being informed, creating awareness, and teaching the correct method of Breast Self-Examination. Similarly, Lager Lund's study indicated that having a sufficient degree of breast cancer and breast self-examination knowledge was a positive effective factor [23] Women who are taught to do BSE had a higher degree of understanding regarding breast cancer, according to Hyun's research [24].The main reason for selecting the age group 18-25 was to ensure that these young females are aware of the proper technique for breast self-examination, as well as we aimed that these 300 students will raise awareness in the society, and help others to identify and detect any abnormal changes in the breast, resulting in early detection of breast cancer and, ultimately, a lower female mortality rate. The levels of pre- and post-training knowledge, as well as the actual risks of breast cancer among these women, were examined in this study.

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Anatomy Section

Effect of Colours on Perception and Cognition of Students Belonging to Two Different Age Groups: A Cross-sectional Study

Kindly acknowdge change in the title

SHUBHAM GUPTA LALBABUPRASAD[1], ANITA RAHUL GUNE[2]

ABSTRACT

Introduction: Colour is believed to stimulate senses. It improves the attention span and helps in developing cognitive abilities and hence, can be beneficial in the educational set-up. There is a void in literature about usefulness of colours in the education settings in India.

Aim: This study was conducted to assess students' preference, perception, emotional responses, memory, and cognition related to colours.

Materials and Methods: A cross-sectional study conducted over a period of two months (January-February 2018) comprised of 300 students divided into two equal groups: Group A with 13 to 18 years of age, Group B with 19 to 25 years of age. On four consecutive days, both the groups were exposed to the same power point slide with some words highlighted with a single colour (red: material related to discovery of earth's polarity, blue: material related to arbovirus, yellow: material related to

pathophysiology of diabetes mellitus, or green: material related to Mangalyan). At the end of the fourth session, a validated questionnaire was used to evaluate the students' perceptions and responses to various colours. The data were analysed using R software v 3.6.1. The Kruskal-Wallis test was used to find significant differences within the group, $p<0.05$.

Results: In group A, the highest mean preference was observed for the colour red (mean=8.02 ± 2.83; p=$2.20e^{-16}$), blue was found to be a soothing colour (n=65) and yellow helped in better recollection of facts (n=44). In contrast, in group B, the highest mean preference was observed for the colour blue (mean=8.35 ± 3.59; p=$5.90e^{-15}$). Yellow was considered a more soothing colour (n=43), and black helped in better recollection (n=41).

Conclusion: Colour perception varies in different age groups. It also affects emotions, memory, and influences mood disposition.

INTRODUCTION

Colour is a visual enhancement element that is vital in improving the learning process [1]. It is known that visual stimulation through colour helps in improving the attention span, developing cognitive abilities and in refreshing one's perception. Finding an appropriate Colour for educational settings is complex as it involves personal preferences, perceptions and differences in emotional response [1].

Human memory is stimulated by different contrasting values of colour [2]. Colours have been proven to be effective in patients with dyslexia and autism as it helps in minimising reading difficulties [3,4]. Colours are instrumental in regulating emotions/mood. Light reflected from coloured objects is converted into electrical impulses by the retina and relayed to the brain that governs our hormones and endocrine system and in turn affects various aspects of cognition and perception [5].

Educators also use different colours to improve learning outcomes. It has been noticed that red ink is conventionally used by teachers to check assignments. It is done to draw an individuals' attention towards their errors. Red is perceived to be a threatening colour but also makes one apprehensive and improves the learning outcome, in that it reduces the repetition of errors [6]. Colours, therefore, have a significant role to play in the educational set-up [7].

In the educational setting, high demands are placed on students for academic excellence. There needs to be strategies to enhance cognitive abilities which in turn will facilitate the learning process. It has been seen in the study conducted by Olurinola O and Tayo O, that colour helped in increasing retention rate of learners [7]. Studies on the usefulness of colour in educational settings in India are few [6,8]. Therefore, the study was conducted to assess colour preferences and perception, emotional responses towards colours

and colours related to memory and cognition in different age groups in India.

MATERIALS AND METHODS

A cross-sectional study was conducted on 300 subjects over a period of two months (January 2018 to February 2018), following approval by the Institutional Ethics Committee (DMCK/148/2018, 14/05/2018). The study was conducted among students from Shantiniketan School (CBSE), Kolhapur, Maharahtra and DY Patil Medical College, Kolhapur, Maharashtra, India. Assent was taken from students between the age of 13 to 18 years and consent from students between 19 and 25 years. Assent was signed by students along with the guardian teacher.

Inclusion criteria: Students between the age group of 13-25 years and willing to participate in the study were included.

Exclusion criteria: Students with learning or memory related disorders were excluded.

Participants were divided into two groups according to age (Group A-13 to 18 years, Group B-19 to 25 years; n=150 each). Considering $\alpha=5\%$, $\beta=20\%$, power=80 % the sample size was calculated as 150 for each group.

Two groups of students were shown the same presentation at different session. In four consecutive days, both groups were exposed to the same power point slide some words highlighted with a red, blue, yellow and green colours respectively. Different colours, red: material related to discovery of earth's polarity, blue: material related to arbovirus, yellow: material related to pathophysiology of diabetes mellitus, or green: material related to Mangalyan were used for the slides and were displayed for 15 minutes. At the end of the fourth session, a validated questionnaire was used to collect the

data (Annexure). The sessions were conducted in the morning for two hours; to maintain uniformity in both groups and to avoid any kind of cognitive bias.

Study Tool

The questionnaire tool was validated by six experts from various departments of the tertiary care hospital. The final questionnaire consisted of 20 questions regarding colour preference, perception, emotional responses as well as memory and cognition related questions. The colour black was also given as an option apart from red, blue, yellow, and green. The questionnaire included both close-ended and open-ended questions.

STATISTICAL ANALYSIS

The data were analysed using R software version 3.6.1. Colour preferences, perception, emotional response as well as memory and cognition related colours were represented using frequency distribution. A minimum Content Validity Ratio (CVR) value of 0.99 was considered the cut-off value to retain an item in the proforma [9]. Colour preference based on age group was represented using mean±SD. The Kruskal-Wallis test was used to find significant differences among colours within the group. The p-value <0.05 was considered statistically significant.

RESULTS

The mean age of students in group A and group B were 15.2±2.5 years, 21.5±3.0 years, respectively. In Group A, red appeared to be the most attention-grabbing colour (26.0%). Yellow was the colour that helped in better recollection of facts in 29.33% of the study sample [Table/Fig-1].

Total not 150 kindly check

Questions	Colour preferences				
	Red	Blue	Green	Yellow	Black
	n (%)				
Colour you like more	8 (5.33)	70 (46.67)	13 (8.67)	43 (28.67)	16 (10.67)
Bedroom wall colour	33 (22.0)	46 (30.67)	18 (12.0)	41 (27.33)	12 (8.0)
Attention grabbing colour	39 (26.0)	38 (25.33)	15 (10)	32 (21.33)	26 (17.33)
More soothing colour	8 (5.33)	65 (43.33)	15 (10.00)	15 (10.0)	20 (13.33)
Colour which increases appetite	46 (30.67)	26 (17.33)	26 (17.33)	34 (22.67)	18 (12)
Colour which better defines personality	18 (12.0)	60 (40.0)	15 (10.0)	35 (23.33)	22 (14.67)
Clothing colour	25 (16.67)	38 (25.33)	21 (14)	33 (22)	33 (22)
Colour which makes feeling calm and relaxed	26 (17.33)	47 (31.33)	26 (17.33)	39 (26)	12 (8)
Captivating colour	28 (18.67)	47 (31.33)	20 (13.33)	30 (20)	25 (16.67)
Colour which helps in better recall	16 (10.67)	36 (24.0)	16 (10.67)	44 (29.33)	38 (25.33)

[Table/Fig-1]: Distribution of colour preferences based on age group (Group A: 13 to 18 years)

In group B, Blue appeared to be the most attention-grabbing colour (30.67%) and was also considered as a captivating colour by 43.33% of the subjects. Black was the colour that helped in better recollection of facts (27.33%) [Table/Fig-2].

Among group A participants, most of the students felt that colour was related to mood and emotions (78%). Maximum students felt that colour plays an important role in memorising things (67%). Colours were found to be the most memorable aspect in advertisements or commercials among group A study subjects (89%) [Table/Fig-3].

Among group B participants, most of the students felt that colour was related to mood and emotions (96%). Many students felt that colour plays an important role in memorising things (69%). Colours were found to be the most memorable aspect of advertisements or commercials among group B study subjects (71%) [Table/Fig-4].

Questions	Colour preferences				
	Red	Blue	Green	Yellow	Black
	n (%)				
Colour you like more	35 (23.33)	44 (29.33)	8 (5.33)	31 (20.67)	32 (21.33)
Bedroom wall colour	11 (7.33)	63 (42.0)	22 (14.67)	43 (28.67)	11 (7.33)
Attention grabbing colour	33 (22)	46 (30.67)	10 (6.67)	25 (16.67)	36 (24)
More soothing colour	29 (19.33)	41 (27.33)	23 (15.33)	43 (28.67)	14 (9.33)
Colour which increases appetite	21 (14)	53 (35.33)	22 (14.67)	43 (28.67)	11 (7.33)
Colour which better defines personality	25 (16.67)	47 (31.33)	9 (6)	27 (18)	42 (28)
Clothing colour	22 (14.67)	42 (28.0)	40 (26.67)	30 (20)	16 (10.67)
Colour which makes feeling calm and relaxed	22 (14.67)	48 (32.0)	12 (8.0)	30 (20)	38 (25.33)
Captivating colour	7 (4.67)	65 (43.33)	22 (14.67)	40 (26.67)	16 (10.67)
Colour which helps in better recall	33 (22.0)	35 (23.33)	9 (6.0)	32 (21.33)	41 (27.33)

[Table/Fig-2]: Distribution of colour preferences based on age group (Group B: 19 to 25 years).

Questions	Agree		Disagree	
	n	%	n	%
Do you think children love to read from the books that are coloured and have illustrations and diagrams?	150	100	0	0
Do you think coloured diagrams drawn in exams fetch more marks than students who don't draw diagrams?	83	55	67	45
Do you think colour affect your mood?	114	76	36	24
Does the colour of the cloths of the person talking to you affect your mood or attitude towards them?	86	57	64	43
Do you think the colour of the question paper affect student's ability to think?	71	47	79	53
Do you think colours are gender oriented?	37	25	113	75
Do you think colour affects taste or appetite?	66	44	84	56
Do you think colour is related to mood and emotions?	117	78	33	22
Do you think colour plays an important role in memorising things?	101	67	49	33
Do you think the most memorable thing in advertisement or commercials is colour?	133	89	17	11

[Table/Fig-3]: Proportion of agree and disagree according to different questions (Group A: 13 to 18 years)

There was a statistically significant difference among colour preference in group A, with the highest mean value for red colour (mean=8.02±2.83; p=2.20e^{-16}) [Table/Fig-5].

There was a statistically significant difference among colour preference in group B, with the highest mean value for blue colour (mean=8.35±3.59; p=5.90e^{-15}) [Table/Fig-6].

DISCUSSION

Colour has a profound effect on our mood and behaviour. It impacts our emotional state, cognition, memory, and general disposition and has an impact on almost every aspect of our being. Given the powerful influence of colour on an individual and on the community, it would be prudent to utilise the impact of colour on the human mind, especially in an educational set-up where the human mind is trained and tuned. In the educational setting, the utilisation of cognitive abilities by students is very important and may contribute to better academic achievement [10]. Hence, it is important to understand the influences of colour on learning and what colours are best for specific age groups [7]. Thus, the study aimed to evaluate the perception and effect of colour on cognition in various age groups.

Questions	Agree		Disagree	
	n	%	n	%
Do you think children love to read from the books that are coloured and have illustrations and diagrams?	150	100	0	0
Do you think coloured diagrams drawn in exams fetch more marks than students who don't draw diagrams?	83	55	67	45
Do you think colour affect your mood?	114	76	36	24
Does the colour of the cloths of the person talking to you affect your mood or attitude towards them?	86	57	64	43
Do you think the colour of the question paper affect student's ability to think?	54	36	96	64
Do you think colours are gender oriented?	15	10	135	90
Do you think colour affects taste or appetite?	96	64	54	36
Do you think colour is related to mood and emotions?	144	96	6	4
Do you think colour plays an important role in memorising things?	104	69	46	31
Do you think the most memorable thing in advertisement or commercials is colour?	106	71	44	29

[Table/Fig-4]: Proportion of agree and disagree according to different questions (Group B: 19 to 25 years).

Colour	Mean±SD	p-value
Blue	6.62±2.81	<0.0001
Green	6.43±3.02	
Yellow	3.5±2.45	
Red	8.02±2.83	

[Table/Fig-5]: Colour preference based on age group (13-18 years).
*p≤0.05 was considered statistically significant, Kruskal-Wallis Test used

Colour	Mean±SD	p-value
Blue	8.35±3.59	<0.0001
Green	7.24±2.9	
Yellow	5.39±2.8	
Red	6.07±3.13	

[Table/Fig-6]: Colour preference based on age group (19-25 years).
*p≤0.05 was considered statistically significant; Kruskal-wallis test used

Kindly explain which values as mean and sd are given in [Table/Fig-5,6]

Variations in the preferences and perceptions were observed in both the groups. Differences could be explained by the fact that as the individual gets older, his/her preferences change based on their life experiences [11].

In the 13-18 years age group highest mean was observed for the colour red. This can be ascribed to the longer wavelength of red; and hence is perceived to be stimulating, lively and friendly [12,13]. In contrast, in the 19-25 years age group, the highest mean was observed for the colour blue. This can be ascribed to different amounts of irradiance from 440 nm to 490 nm [14]. Hence, blue colour is perceived to stimulate intellectual activity, reason and logical thought that develops as the individual grows older [12].

In group A, blue was perceived as a soothing colour. In the state of relaxation, blue stimulates the alpha band in the occipital areas [14]. It is often associated with openness, peace and tranquility [15]. On the contrary, in group B, yellow was perceived as the more soothing colour. This can be attributed to changes in the oxygenated haemoglobin (O_2Hb) and deoxygenated haemoglobin (Hb) concentrations in the Left Prefrontal Cortices (L-PFC) [16]. It is often perceived as the colour that lets the sunshine in [5].

The colour that increased appetite was red in group A. In contrast, in group B, blue Colour was found to be appetite stimulating. Students in group B agreed that colour affected taste/appetite and this has been studied in previous literature as well [17,18]. This can

be ascribed to hormones that are released in the brain, when colour perception is transmitted from the eye to the brain. In turn, colours are used to "level out" emotions or to create different moods [5]. Colours could thus be used to stimulate or reduce appetite and could play a significant role in weight management issues among adolescents. Blue is the colour of intellect and stimulates clear thoughts [19]. It was perceived as the colour which defines the participants' personality among both the groups.

In both groups, blue was the preferred colour for dressing and made them feel calm. Participants in both groups agreed that their mood was affected by colour, as observed in previous literature [20]. Their attitude was also affected by the clothes' colour of other people. This can be ascribed to the fact that colour is an essential part of our lives and its existence is seen in everything that we perceive. Hence, colour has a profound effect on our feelings and expressions [21].

Among group A students, red was the most attention-grabbing colour. In contrast, in group B, blue was considered the most attention-grabbing colour. The most captivating colour among both the groups was the colour blue. Among group A students, the colour yellow helped in better recollection of facts. In contrast, in group B, the colour black helped in better recollection. Participants in both the groups agreed that children love to read from coloured books and also felt that coloured diagrams fetched more marks in exams. Students in both the groups agreed that colours helped in memorising better as observed in previous studies [22]. This could be explained by the fact that colour draws on cognitive powers to influence learning, facilitating memorisation and identification of concepts. It also affects the way we perceive and process information and can upgrade our ability to recall both words and pictures [23-25].

Students also felt that the most memorable aspect of advertisement and commercials are colours as seen in previous studies as well [26,27]. This can be attributed to the fact that colours can evoke perceptual and emotional responses in consumers and influence their behaviour [28,29].

Limitation(s)

Limitations of the study include the fact that colour perception based on gender, age wise stratification within the group was not assessed and provides scope for further research in the arena.

CONCLUSION(S)

Colour perceptions/cognition varies among different age groups of students. Colour has the potential to transmit the stimuli to a more permanent state in the memory of students. Colour is perceived to help in memorisation of facts and its integration in papers, books and presentations can improve cognition and learning outcomes among students of all age groups.

Contribution

Design and conception: SGL, ARG; Collection and gathering of data: SGL, ARG; Clinical monitoring and laboratory detection: SGL, ARG; Data analysis and interpretation: SGL, ARG; Manuscript preparation: SGL ARG; Approval of Manuscript: All authors.

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PARTICULARS OF CONTRIBUTORS:
1. Third Year MBBS, Undergraduate, Department of Anatomy, D.Y. Patil Medical College, D. Y. Patil Education Society (Deemed University), Kolhapur, Maharashtra, India
2. Associate Professor, Department of Anatomy, D.Y. Patil Medical College, D. Y. Patil Education Society (Deemed University), Kolhapur, Maharashtra, India

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Anita Rahul Gune,
Department of Anatomy, D.Y. Patil Medical College, D.Y. Patil Education Society (Deemed University), Kolhapur, Maharashtra, India.
E-mail: anitargune@gmail.com

QUESTIONNAIRE

D.Y. PATIL MEDICAL COLLEGE, KOLHAPUR
Annexure

Effect of Colours on Perception and Cognition of Students belonging to two different age groups 13 - 18 & 19 - 25 years

This study provides us meaningful insight to the use of Colour in increasing retention rate of learners, especially adult learners. The questions are to introspect the Effect of Colours on Perception and Cognition of Students belonging to two different age groups 13 - 18 & 19 - 25 years.

Sr. No.	Questions	Red	Blue	Green	Yellow	Black
1	Which colour out of these do you like more					
2	What colour out of these would you like the walls of your bedroom to be					
3	Which colour out of these according to you attracts or grabs more attention?					
4	Which out of these colour is the most soothing colour according to you?					
5	Which colour out of these do you think increases appetite?					
6	If you were asked to relate yourself to the colours, which colours out of these do you think suits you or describes you the best?					
7	What colour of cloths out of these do you generally like to wear?					
8	Which colour out of these makes you feel calm and relaxed?					
9	Which colour out of these do you think is captivating?					
10	Which colours out of these helps you for better recall?					
11	Do you think children love to read from the books that are coloured and have illustrations and diagrams?					
12	Do you think coloured diagrams drawn in exams fetch more marks than students who don't draw diagrams?					
13	Do you think colour affect your mood?					
14	Does the colour of the cloths of the person talking to you affect your mood or attitude towards them?					
15	Do you think the colour of the question paper affect student's ability to think?					
16	Do you think colours are gender oriented?					
17	Do you think colour affects taste or appetite?					
18	Do you think colour is related to mood and emotions?					
19	Do you think colour plays an important role in memorising things?					
20	Do you think the most memorable thing in advertisement or commercials is colour					

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Title: IMPACT OF HOUSEHOLD POISONS AWARENESS PROGRAM ON KNOWLEDGE AND ATTITUDE AMONG PRIMARY SCHOOL CHILDREN IN URBAN MAHARASHTRA.

By: Hemanshi Sirohi

II Year MBBS

D.Y. Patil Medical College, Kolhapur

Guide: Dr. Pratapsingh Rathod

Assistant Professor

Department of Forensic Medicine

D.Y. Patil Medical College, Kolhapur

Introduction:

Childhood is a phase of life in which many things are explored with curiosity by children and then the surroundings may become dangerous place if the chemical compounds used daily for many purposes in and around the house are unintentionally ingested or inhaled or touched by the children. Many children get intimidated with colorful drugs, cosmetics and improperly stored poisons and get fatally intoxicated.

Majority of poisoning among adolescents and adults are intentional [2,3] while most of the pediatric poisoning cases are preventable and accidental[4,5], caused by easy availability of toxic substances for children in houses. Household products including medicinal compounds, cosmetics & toiletries, detergents, disinfectants, organic solvents, petroleum products, pesticides and contaminated food are most common means of poisoning in children globally as well as in India.[6,7] Pediatric poisoning is a significant cause of morbidity and mortality responsible for 0.33% to 7.6% of total admissions in pediatric wards at various hospitals across India and household poisons are the prime reason.[8,9]

Knowledge about common household poisons is lacking not only in children's but also in adults. In a study from India, around 20 percent of medical students and more than 65 percent of non-medical students were found unaware of the hazards caused by household poisons.[10]

Prevention of poisoning through health education programs targeting children have been conducted worldwide[11,12,13] and it was found to be very useful means to reduce the burden of the problem. But in India, there is dearth of data regarding evaluation of effectiveness of educational interventions on prevention of childhood poisoning. Hence under the present study, health education on household poisons will be given to primary school children and its effectiveness will be assessed. Proper education and knowledge of poisons from early life is important among children.

Objectives:

1. To study knowledge and attitude towards household poisons among primary school children.
2. To assess the effectiveness of Household Poisons Awareness Program on knowledge and attitude among primary school children.

Methodology:

The study will be conducted over period of two months in seven primary schools in urban area.

Study setting: Seven primary schools from urban field practice area of a Medical College will be selected.

Study design: Interventional study.

Study population: Primary school children of 4th and 5th standard.

Sampling technique: One division of 4th and 5th standard each will be selected randomly among the seven primary schools.

Sample size: 500-600 Primary School Students

Study variables: Knowledge about household poisons, knowledge about other common poisonous substances, attitude towards poison exposure and knowledge on preventive measures from poisoning.

Proposed intervention & Data Collection:

Agreement for implementation of the awareness program will be obtained from the school authorities and assent forms from the parents will be collected consenting to participate in the study on behalf of students.

Validated pre-test questionnaire consisting 10 questions addressing knowledge and attitude towards household poisons will be given to all the students before intervention of the health education program and their prior knowledge will be assessed. Faculty trained and well versed with health education program will be conducting didactic lectures followed by video demonstration and demonstration of specimens of various poisons. Information regarding common agents involved in childhood poisoning, common household poisons, instructions for prevention of poisoning and primary care for poisoning conditions will be provided during this program. Evaluation of the program will be carried out 2 weeks later in the form of post-test questionnaire administered to the same students. Data thus collected in the form of pre-test and post-test will be analysed.

Data analysis: Data collected will be entered in MS excel worksheet and will be analysed using SPSS version 20.0. Chi-square test and paired 't' test will used to study the significant improvement of knowledge and attitude about household poisons by comparing pre-test and post test results.

Ethical considerations:

School authorities as well as the students will be informed well in vernacular language about the study protocol and the ascent will be obtained from the respective parents on behalf of students before starting the study. Confidentiality and anonymity of the Students will be maintained throughout the study process. Ethical clearance will be obtained from the Institutional Ethics Committee before starting the study.

Implications:

School based health education and awareness programs improve the children's knowledge about prevention of poisoning and hence schools provide a good opportunity for prevention. Primary school children form the most vulnerable group for household poisoning and

accidental poisoning; hence educating those children about household poisons is crucial in prevention. In the present study efficacy of the intervention in the form awareness program will be evaluated in terms gain in knowledge and change in attitude and based on the results more such programs will be planned in future.

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01. What is a poison

    A. A substance which causes diarrhea/vomiting when eaten
    B. A substance which causes irritation in eyes if it accidentally enters in the eye
    C. A substance which causes a skin rash when it touches the skin
    D. All of the above

02. Which of the following is safe to drink?

A. Phenyl

C. Water

B. Glass cleaner

D. Petrol

03. Which of the following animal around your house could be poisonous?

A. Scorpion

C. Spider

B. Snake

D. All of the above

04. Is it OK to eat fruits or leaves from bushes or trees outside the house?

    A. Yes, because I think all fruits are edible   **C.** I will eat it only if it looks attractive
    B. I will ask my friend   **D.** I will ask an elder before eating it

05. Which of the following compound could be <u>harmful</u> if you accidentally drink it?

    A. Apple juice   **C.** Kerosene
    B. ORS   **D.** Lemonade

06. We know that medicines/syrups are good for health. Is taking excess number of medicines/syrups also good for health?

    A. I think it will make me stronger
    B. Medicines should be taken only in amounts prescribed by the doctor
    C. Taking more medicines will heal me faster
    D. The dose of medicine I take is not important

07. A home cooked food item is kept in my fridge for more than 4 days. What should I do?

    A. I should smell it and then decide   **C.** I should eat it
    B. I should consult an elder and eat it   **D.** I should not eat it

08. Which of the following is edible?

A. Candy

C. Naphthalene balls

B. Phenyl

D. Dish wash

09. Which of the following is **not** harmful for health?

A.

C.

B.

D.

10. If you see your younger sibling or a small child playing with a box containing medicines, what steps will you follow?

	STEP-1	STEP-2	STEP-3	STEP-4
A	Call the doctor	Call an adult	Check if child has ingested any medicine	Take the box away
B	Take the box away	Call an adult	Check if child has ingested any medicine	Call the doctor
C	Check if child has ingested any medicine	Call the doctor	Call an adult	Take the box away
D	I will first take the box away from him and then call for an adult	Take the box away	Call the doctor	Call an adult

11. Suppose you and your friends are painting using water colors and accidentally paint enters in your eye. What will you do?

    A. Wash my eyes with vinegar   C. Wash my eyes with Savlon/Dettol
    B. Wash my eyes with plenty of water D. Do nothing and continue painting

12. Insecticide sprays come in attractive bottles. What will you do when you come across it?

    A. I will use it as a toy and play with it
    B. I will spray the contents all over the room because it is fun to do so
    C. I will not touch the bottle because it contains harmful chemicals which might harm me
    D. I will use it myself to kill the insects

13. Your mother uses good smelling perfumes and attractive cosmetics. When can you use them?

A. When I'm alone around cosmetics
B. Whenever I want supervision

C. When any elder is around me
D. I will use kids cosmetics in adult

14. Are all plants around my surroundings edible?

A. No, some plants are harmful
B. Flowering plants are edible

C. Yes, all plants are edible
D. Fruit bearing plants are edible

15. If you ingest the wrong pills accidentally, what steps will you follow?

A. I will be scared and tell no one
B. I will act brave as if nothing has happened

C. I will tell an elder person and consult a doctor
D. I will drink plenty of water

16. What is a first aid kit?

A. A small box with toys
B. Small box containing bandages, antiseptic wipes to treat sick or injured people until full medical treatment is available
C. A kit containing delicious food items
D. I don't know about a first aid kit

17. What do you do to your broken toys?

A. I still play with them
B. I try to know what they taste like

C. I break them into smaller pieces
D. I either try to recycle them or throw them away

18. Do you know your parents' mobile number?

A. Yes, I remember it correctly of both my parents'
B. Yes, but I know only one number correctly
C. I remember only half of the numbers correctly
D. No, I don't know any mobile number

Annexure-1

Parental Assent form

D.Y. Patil Medical College, Kolhapur
Department of Forensic Medicine

TOPIC- Impact of household poisoning awareness program on knowledge and attitude of primary school children in urban Maharashtra

- I am Hemanshi Sirohi studying 2nd year MBBS in D.Y. Patil Medical College, Kolhapur. I am doing a research study titled "Impact of household poisons awareness program on knowledge and attitude among primary school children in urban Maharashtra."
- In this study we want to know the knowledge of school going children about household poisons. For this the students studying in one of the section each of 4th and 5th standard are selected randomly, they will be asked few questions regarding household poisons in form of multiple choice questions.
- After this the students will be thought about identifying household poisons, precautionary measures to prevent poisoning.
- After 2 weeks of this education session, the students will again be asked again about the household poisons in form of multiple-choice questions.
- The both pre-test and post-test will be evaluated by us, and data obtained will be used for our study.
- This study is on voluntary basis and will be conducted only after obtaining permission from the parents.
- As we provide health education about household poisoning, it will be helpful for your children in the future.
- There are no foreseeable risks involved in the study, and the study will be conducted only during school hours. If you agree for this study kindly provide your permission in the following certificate.

Consent Certificate

I have been asked to give consent for my of daughter/son to participate in this research study which will involve pre-test, post-test and single education session on household poisons. I have read the foregoing information, or it has been read to me. I consent voluntarily for my child to participate as a participant in this study.

Name of Parent/ Guardian_____

Signature of Parent/Guardian_____

Date_____

Reference ID: 2019-02912

Title: ASSESSMENT OF OCCUPATIONAL HEALTH HAZARDS AND EXPOSURE
TO PESTICIDES AMONG FLORISTS THROUGH HANDLING OF FLOWERS

By: Himanshi Sharma

II Year MBBS

D.Y.Patil Medial College, Kolhapur

Guide: Dr.Ashutosh B Potdar

Associate Professor & I/C HOD

Department of Forensic Medicine

D.Y.Patil Medial College, Kolhapur

Introduction:

Flowers are used daily for poojas in Indian context and throughout the year for various occasions like weddings or other celebrations. Flowers are mediators for expressing love, gratitude, friendship or appreciation. India has majority of markets for floral industry among Southern states with estimates of Rs 1219.4 million worth daily production of flowers and considering Mumbai region alone around 10,000 to 30,000 dozen of flowers are traded daily.[1]

These flowers are grown with extensive treatment with pesticides unlike other crops which are grown for consumption and there are very few restrictions for pesticide use to yield good crop. Flowers are sprayed with maximum pesticides until harvest and transported directly to the markets. In such unique risk situation, the florists handling such flowers could be exposed to many pesticide residues during their professional activities. A study conducted recently in Belgium revealed that florists come across 111 different chemicals mainly insecticides and fungicides and individual florist exposed to 37 active substances.[2]

Most of the pesticides applied on the flowers are persistent, fat soluble and dislodge able from flower to hands hence easily absorbed through skin with absorption continued as long as the pesticide remains in contact with the skin. Dermal exposure to pesticides causes health problems ranging from dermatitis, contact allergies[3,4], peripheral neuropathy[5,6] and endocrine

disorders[7]. Reproductive problems including abortions, stillbirths, prematurity and congenital malformations also have been reported due to occupational exposure to pesticides.[8] Despite potential exposure to pesticides and high-risk situation no information is available in India about health hazards and risk assessment among florists who are actively engaged in preparation of bouquets and garlands.

Objectives:

1. To assess the detrimental effects on health due to chronic exposure to pesticides among the florists.
2. To assess the awareness of personal protective measures among florists.
3. To estimate the dermal exposure to various pesticides among florists.

Methodology:

The study will be conducted over period of 2 months including florists on voluntary basis.

Study setting: Out of sixty-five florists in the city forty florists actively engaged in handling flowers daily for preparation of bouquets and garlands with work experience more than ten years will be recruited in the study on voluntary basis after getting prior consent.

Study variables: Demographic data, personal history including: age, sex, time spent in preparing bouquets and garlands, years of experience working as florists, personal protective devices used, and profile of active substances detected in the samples of cotton gloves.

Data Collection: Data will be collected using pre-tested and validated self-administered questionnaire as data instrument to know the demographic profile, personal history including history of cancer or obstetric history (abortions, premature deliveries, congenital malformations among their children), time spent in preparing bouquets and garlands, experience of working as florists counted in years (more than 10 years), personal protective devices used and its awareness, hygiene practices. They will be examined for presence of skin ailments, neuropathies or any other illness with the help of dermatologist. Also, two pairs of cotton gloves will be provided to each of the participant florist to wear for 2 consecutive days while handling flowers for preparation of bouquets and garlands. These two pairs will be collected as single sample (4

gloves per sample), will be cut into small pieces and subjected to combination of liquid and gas chromatography tandem mass spectrometry for analysis of residues of pesticides. Profile of active substances detected in those samples will be prepared. The cost of this test which is approximately 30,000 to 50,000 rupees will be paid by the student.

Data analysis: Data collected will be entered in MS excel worksheet and will be analysed using SPSS version 20.0. Chi-square test and McNemar's test will used to study the association among the study variables.

Ethical considerations:

Study participant florists will be informed well in vernacular language about the study protocol and their informed consent will be obtained before starting the study. Confidentiality and anonymity of the participants will be maintained throughout the study process. Participation in the study will be entirely on voluntary basis and without causing any harm to the participants. Ethical clearance will be obtained from the Institutional Ethics Committee before starting the study.

Implications:

Florists are working in a unique risk situation whereby they are exposed to various pesticide residues during the professional activities. There are ample of researches conducted in European and American contexts on this topic, but it remains neglected area in India. Hence it was deemed necessary to assess the health hazards among the people who are involved in handling of flowers. After deriving the results, it will be considered if recommendations are required to raise the level of awareness among the florists which can minimize the exposure by adequate prevention and proper protective measures like wearing gloves, washing their hands and arms.

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Consent form
D.Y. Patil Medical College, Kolhapur
Department of Forensic Medicine

I, Mr/Mrs/Ms .... Gender .... Age: ....
residing at ....
do hereby confirm that:

I.   I have been asked by the student of D Y Patil Medical College, Hospital and Research Centre, Kolhapur ("the Medical College") whether I wish to participate in a study (research) under the aegis of the Medical College.

II.   In this study, I want to know whether there is any exposure of pesticides to the florists. For this, florists all over Kolhapur, who are working as florists for past 10 years will be selected and then will be asked to provide general information like, age, working since, total working hours in a day, habits. After this an examination will be done for any skin ailments by dermatologist. Later, you will be asked to wear gloves for two consecutive days while working. After two days, gloves should be returned which will sent to lab for analyzing presence of any pesticides on the gloves.

III.   Forty florists will be recruited in the study on voluntary basis after getting prior consent.

IV.   We will also be providing health education, preventive measures regarding occupational hazards

V.   The nature of the study being undertaken by the student/ researcher, as well as the extent of my participation in it, have been duly explained to me in a language that I understand;

VI.   The potential risks and consequences associated with this study have also been duly explained to me in a language that I understand;

VII.   I also understand that my participation in this study is only for the benefit of advancement in the field of medical research and that at no point in time is my participation being solicited for any pecuniary gain by the researcher or the Medical College;

VIII.   I have also been explained that I am in no way obliged to participate in the study and that, once I have agreed to participate in the study, I am still free to withdraw from participation in the study at any point in time upon notifying the Medical College in writing in the prescribed form without assigning any reason;

IX.   There will be no financial transaction between myself, the researcher and/or the D Y Patil Medical College for my participation in that study;

X.   I have been explained that any data collected out of my participation in the study will only be used for academic purposes and/or for further medical research;

XI.   I have also been reassured that any publication of the data collected during the study or any publication of its conclusions, shall be done on a 'no names' basis and shall under no circumstances reveal my personal identity. Any personal details likely to reveal my personal identity shall always remain confidential;

XII.   I understand that if any accident or undesirable medical complication arises out of a procedure or treatment done solely for research, I will be offered treatment, free of cost, by the D Y Patil Hospital & Research Centre free of cost, by the D Y Patil Hospital & Research Center, Kolhapur. Any additional compensation considered necessary by the Institutional Ethics Committee may also be given to me.

Questionnaires

Serial no: Age: Sex:

- Address:
- Working since(years):
- Time spent preparing bouquets or garlands (hours/day):
- Complaints related to my research topic:

  A.   Neurological symptoms
    1. Dizziness:
    2. Headache:
    3. Loss of sensation:
    4. Fatigue:

  B.   GI symptoms
    1. Diarrhea:
    2. Nausea:
    3. Fever:

  C.   Eye symptoms
    1. Irritation in eyes:
    2. Watering of eyes:
    3. Blurring of vision:

  D.   Dermal symptoms
    1. Irritation:
    2. Itching:
    3. Swelling:

  E.   Respiratory symptoms
    1. Difficulty in breathing:

  F.   Any other complaints:

- Any awareness of pesticides:
- Use of protective measures:
  1. Gloves
  2. Washing of hands and arms after work or before having food.
  3. Washing of eyes after work
  4. Use of mask while working

By affixing my signature/thumb print hereto, I am therefore freely and voluntarily signifying my consent, intent and willingness to participate in the study of the student researcher for the purposes of the INDIAN COUNCIL OF MEDICAL RESEARCH - STS under the egis of the Medical College. I also certify that my right to privacy has not been infringed in any manner.

[SIGNATURE/THUMB PRINT OF PARTICIPANT]
DATE:

WITNESSED BY:
1. Name: _____   2. Name: _____

   Signature : _____   Signature: _____

Name of Project investigator: _____

Address: _____   Contact Number: _____

Signature of investigator:

भारतीय आयुर्विज्ञान अनुसंधान परिषद
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This is to certify that *Ms. Himanshi Sharma* student of *MBBS-II of Dr. D. Y. Patil Medical College, Kolhapur* has been awarded the Short Term Studentship (STS) for a period of two months during 2019 under the guidance of *Dr. Ashutosh Baliram Potdar for the project entitled, "Assessment of occupational health hazards and exposure to pesticides among florists through handling of flowers" (Ref. No. 2019-02912)* and the Report was found to be satisfactory.
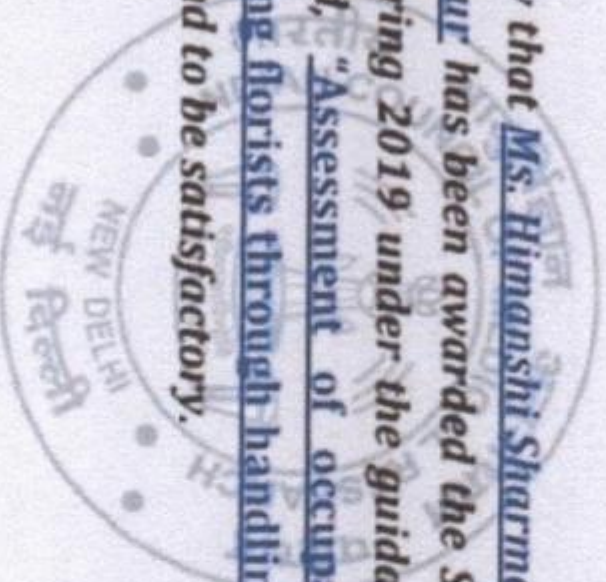
MEDICAL RESEARCH

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Scientist G & Head, HRD
ICMR

Prof. (Dr.) Balram Bhargava
Secretary, Department of Health Research &
Director General, ICMR

STS
2019
SHORT TERM STUDENTSHIP

JPAM
JOURNAL OF PURE AND APPLIED MICROBIOLOGY

RESEARCH ARTICLE   OPEN ACCESS

Bacterial Contamination of White Coats among Medical Personnel- A Cross Sectional Study in Kolhapur, India

P. Arun Kumar (ID), Roma A. Chougale* and Indireddy Sinduri

Department of Microbiology, D.Y. Patil Medical College, Kolhapur - 416 005, Maharashtra, India.

Abstract

To minimize exposure to hazardous biological materials, all doctors, nurses, technicians and in general all the healthcare personnel as well as researchers wear a knee-length, long-sleeved, elastic-cuffed laboratory coat while working with hazardous materials. A white coat provides a protective layer and can be easily removed if contaminated. White coats act as mechanical vectors in transmission of pathogenic and non-pathogenic bacteria to the people who are associated with health care workers. A total of 120 specimens were collected by using sterile cotton swabs. Of these, 88 (73%) white coats were contaminated. At the same time, a pre-validated and semi-structured questionnaire (containing questions regarding usage of white coat, purpose, hygiene, and perception about contamination of white coats, etc) was distributed. Gram positive cocci 64 (72.72%) were isolated more than gram negative bacilli 24 (27.28%). Most of the tested antibiotics showed resistance to isolated gram positive and gram negative bacteria. 10 (41.66%) isolates of gram negative bacilli were resistant to extended spectrum beta-lactamases (ESBL) and 10 (6.4%) of staphylococcal isolates showed Methicillin resistance. Therefore, a much more attention to wear a clean white coat should be required.

Keywords: White coat, ESBL, MRSA, Gram negative bacilli, Gram Positive cocci

*Correspondence: neetiroma@gmail.com; +91 9890275056

INTRODUCTION

White coat to a person in medical field is just like what skin is to a human[1]. To protect their street clothes from contamination, medical and laboratory professionals wear a knee length over coat which is known as white coat[2]. It is a symbol of professionalism, identification[3], trust and respect from others, where white color indicates purity and goodness[1,3-7]. In many medical institutions "White Coat Ceremony" is conducted to welcome MBBS students to the medical field[8,9].

To minimize exposure to hazardous biological materials, proper clothing and/or personal protective equipment (PPE) should provide reasonably complete coverage of the skin and clothing. Most of the Scientists and Doctors prefer to wear a knee-length, long-sleeved, elastic-cuffed white coat while working with hazardous materials. A white coat provides a protective layer and can be easily removed if contaminated. Reusable white coats should be cleaned regularly[14] White coats are worn by all medical practitioners. However, when, how and where they wear and wash their white coats varies from person to person and even between different institutions[5]. Healthcare workers and students commonly wear white coats in restaurants, libraries, super-marts etc and also keep them in vehicles and office[3,8,11]. Pediatricians and Psychiatrists generally prefer not to wear white coats in order to decrease anxiety among these categories of patients[7,12]. Transient increase in blood pressure of patient by just seeing a doctor in a white coat is known as "white coat syndrome"[12].

Despite practicing strict infection control measures, white coats act as mechanical vectors in transmission of pathogenic and non-pathogenic bacteria to the people who are associated with health care workers[1]. Healthcare- associated infections (HAI`s) pose a great risk of morbidity and mortality, as well as increased length of stay in hospital and cost of treatment[2,6,11]. Some antibiotic resistant strains like MRSA, which may spread among clinical and nonclinical persons, are found on white coats.[3,5,11,13]. This finding suggests that the health management of the hospital does not give enough relevance to the white coat use.

There is currently no literature on the contamination of white coats of medical personnel in Kolhapur city of Maharashtra, India. Hence the present study was planned in the Microbiology department of D.Y. Patil Medical College, Hospital and Research centre, Kolhapur, to detect the level and type of bacterial contamination and antibiotic susceptibility pattern of bacteria present on white coats of medical personnel and analyze the risk of spreading HAIs by such contact. Moreover, we also wanted to study the medical personnel's habits of handling the coat, cleaning it and their perception towards white coat contamination.
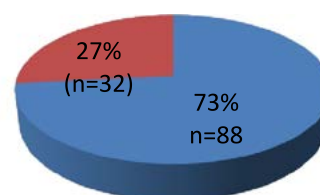
METHODOLOGY

Specimen were collected from pre-clinical, para-clinical M.B.B.S students, staff nurses and resident doctors by using sterile cotton swabs moistened with sterile physiological saline. Swabs were gently rotated to the front side of the lower edge of the white coat. Swabs were labeled properly and transported immediately to the Microbiology laboratory (D.Y. Patil Hospital and Research Institute, Kolhapur).

Swabs were inoculated into MacConkey agar and Blood agar and incubated at 37°C for 24 hours. After incubation, growth was confirmed by colony morphology on agar plates and gram stained smears of colonies. Biochemical reactions (Catalase, Oxidase, Indole, MR, VP, Citrate, Urease, TSI etc) and Antibiotic sensitivity testing

Table 1. Number of Isolated Bacteria

	Isolated no		Total isolated bacteria
	Male	Female	
Gram Positive cocci	43	21	64 (72.72%)
Gram Negative bacilli	15	09	24 (27.28%)
Total(n)	58 (65.90%)	30 (34.09%)	88

Fig. 1. Total Sample Distribution

■ Contaminated ■ Not Contaminated

27% (n=32)

73% n=88

were performed as per the standard guidelines. Phenotypic confirmation of MRSA and ESBL was also performed as per the CLSI guidelines 2018.[19] At the same time, a pre-validated and semi-structured questionnaire (containing questions regarding usage of white coat, purpose, hygiene, and perception about contamination of white coats, etc) was distributed among the same 120 persons from whom the swabs were collected.

RESULTS

Total 120 samples were collected, out of these 72 were male and 48 were female (Fig. 1).

Of these 88 contaminated specimens, 64 were gram positive bacteria, 24 were gram negative bacteria. See table 1

Out of 64 gram positive cocci, 48 were CONS, 16 were *S. aureus* followed by gram negative bacilli (24). Of these, *E. coli* (12) were found to be more in number than the *Klebsiella spp* (8). Four *Pseudomonas spp.* were isolated. [Table 2].

Table 2. Distribution of Bacterial Isolates

Organisms	Isolation number (n=88)	Percentage
CONS	48	54.55%
S.aureus	16	18.18%
E.coli	12	13.64%

Table 3. Antibiotic Susceptibility Profile for Gram Negative Bacilli

Antibiotics	Sensitive (n=24)	Resistance (n=24)
Amoxicillin –Clavulanic acid(30µg)	22 (91.66%)	2 (8.33%)
Ampicillin (10µg)	16 (66.66%)	8 (33.33%)
Piperacillin-Tazobactum (100/10µg)	23 (95.83%)	1 (4.16%)
Chloramphenicol(30µg)	20 (83.33%)	4 (16.66%)
Ciprofloxacin (5µg)	21 (87.5%)	3 (12.5%)
Gentamicin(10µg)	15(62.5%)	9 (37.5%)
Tetracycline (30 µg)	20 (83.33%)	4 (16.66%)
Meropenem (10µg)	18 (75%)	6 (25%)
Aztreonam (30 µg)	11 (45.83%)	13 (54.16%)
Ceftazidime (30µg)	14 (58.33%)	10 (41.66%)
Ceftazidime Caluvanic acid	14 (58.33%)	10 (41.66%)

All the isolated gram negative bacteria were screened for Extended Spectrum beta-lactamases (ESBL)–by using Ceftazidime and Ceftazidime+ Caluvanic acid discs (Table 3). Of these 24 gram negative isolates 10 (41.66%) were shown to be ESBL producers (CLSI Guidelines 2018)

Methicillin resistance Staphylococci were screened by using Cefoxitin (30µg) disc diffusion method according to the CLSI guidelines 2018*.

Table 4. Antibiotic Susceptibility profile for Gram Positive Bacteria

Antibiotics	Sensitive (n=64)	Resistant (n=64)
Erythromycin (15µg)	38 (59.75%)	26 (40.62%)
Clindamycin (2µg)	38 (59.75)	26 (40.62%)
Cefoxitin (30µg)	54 (84.37%)	10 (16.62%)
Linezolid (30µg)	64 (100%)	00
Vancomycin (30µg)	63 (98.43%)	01 (1.56%)
Chloramphenicol (30µg)	62 (96.87%)	2 (3.12%)
Tetracycline (30µg)	52 (81.25%)	12 (18.75%)
Gentamicin (10µg)	51 (79.68%)	13 (20.31%)
Ciprofloxacin (5µg)	48 (75%)	16 (25%)

Table 5. MRS Distribution

MRSA	3(4.68%)
MRCONS	7(10.93%)

DISCUSSION

Traditionally, the white coat is considered to bring credibility and dignity to the medical profession,[20] but nowadays white coats harbor potential contaminants and these may play an important role in the transmission of pathogenic micro-organisms and resistant determinants.

High rate of the bacterial contamination of white coats is associated with the following factors:

Continuous shedding of infectious microorganisms by patients in hospital environment, who may constantly be in contact with hospital health care workers,

Survival of Microorganisms between 10-98 days on fabrics (Cotton, Polyester etc.) [21,22]

Our institution is a tertiary care hospital, medical college and research institute. Medical students who work in the clinical wards indiscriminately use the white coats even outside the hospital premises.

In our study, male participants were 60% and female participants were 40% [Fig. 1]. In the present study, 73% of the white coats which were screened were contaminated with bacteria [Fig. 2]. Our study shows a similar rate of contamination like Mwamungule *et al.* 2015. They conducted a study on white coats among 107 health care workers in major risky departments (Obstetrics and Gynecology, the out-patient department, Laboratory department, Intensive care unit, Medicine, Pediatrics and Surgery). Of these, they found that 94 (72.8%) were contaminated. This study included hospital personnel except students or interns; hence they found a high rate

Table 6. Questionnaire Distribution (N=120)

Basic variables	No. of white coats examined	No. of white coats contaminated	Contamination rate
1.Gender			
Male	72	52	72.22%
Female	48	36	75%
2.Subjects come from			
Home	54	34	62.96%
Hostel	66	54	81.81%
3.Type of white coat			
Half Sleeves	106	80	75.4%
Full sleeves	14	08	57.14%
4.Washed by			
Own	61	56	91.80%
Laundry	59	32	54.23%
5. Frequency of Washing			
Once a week	44	22	50%
Twice a week	54	35	64.81%
More than twice a week	22	11	50%
6.Usage			
Hospital	18	9	50%
Hospital and college	82	68	82.92%
Non-clinical areas	20	11	55%
7. Duration of Usage			
One hour	1	0	0
Two hour	3	1	33.33%
More than two hour	115	87	75.65%
8. Use of Disinfectant			
Yes	84	61	72.16%
No	35	27	77.14%
9. Last Washed			
2 days before	79	57	72.15%
4 days before	23	17	73.91%
More than 4 days before	18	14	77.77%
10. Practice of handling			
Holding in hands	10	6	60%
In college bag pack	11	5	45.45%
Wear it all time	98	77	78.57%
12.Practice of exchanging			
Yes	118	88	88%
No	1	0	0
12. Stain Present			
Yes	24	19	79.16%
No	95	69	78.40%

of contamination.

Other studies have reported contamination rates of white coats ranging from 23 % to 91.3% (Uneke et al. 2010[21], Treakle et al. 2000[18], Qaday et al. 2015[5]). This varying rate of contamination may be due to the type of the clinical facilities in which the study was conducted.

Table 1 shows that, Gram negative bacilli (27.28%). were isolated in lesser number. This is comparable to the other findings such as A.A Akanbi et al. 2017 (26.21%)[26]. In our study, E. coli were 13.63%, Klebsiella spp (9.09%) and Pseudomonas (4.54%). All these microorganisms are frequently found in the hospital environment, but they have also been implicated as causative agents in nosocomial infections.[26]

As shown in Table 2 coagulase negative Staphylococci (CONS) were the most commonly isolated bacteria (54.54%), followed by S.aureus (18.18%). Gram positive bacteria are more frequently seen in animate and inanimate surfaces and all major implant devices used in hospitals as compared to gram negative bacteria. Our finding is similar to Trupti B. Naik et al. 2015 (54.45%). They conducted a study on white coats among 2nd Year MBBS students who were not frequently exposed to clinical settings and concluded that these Staphylococci may be normal commensal bacteria. Previously, CONS were considered as harmless; but nowadays, due to advances in medical technology like indwelling foreign devices such as joint prosthesis, vascular grafts etc, CONS has emerged as a potential pathogen in hospital environment. However other studies have found S.aureus as the predominant organism contaminating the white coats. (Qaday at al 2015[5], Saxena et al. 2013[25], Banu et al. 2012[8]). This might be due to the difference in the working sites (like ICU, Wards, Accident &Emergency department etc.) of the people on whom the study was conducted.

As seen in Table 4, all 64 Staphylococcal isolates were sensitive to Linezolid, whereas one isolate was resistant to Vancomycin (1.56%), 2 isolates were resistant to Chloramphenicol (3.12%) and 26 were resistant to Erythromycin (40.62%) and Clindamycin (40.62%). This is nearly similar to the finding of A.A Akanbi et al. 2017 (39.39%)[26]. In our study, Methicillin Resistant Staphylococci were isolated from 10 isolates [Table 5]. Of these, 3 isolates (4.68%) were MRSA and 7 (10.93%) were MRCONS. Our finding was lower than the study of Reza et al. 2013(18.18%). Our study was at the tertiary care level, were our faculty is aware about antibiotic resistance and the antibiotic policy of our hospital.

As seen in table 6, we found that usage of the white coats in hospital and college is more (82.92%), followed by volunteers (55%) using it in non-clinical areas (canteens, tea-stalls, reading rooms, temple) and this is highly significant. This finding is similar to the findings reported by Noor et al.[11]. Our study indicates that participants were not aware or do not have the knowledge that white coat harbours microorganisms that may cause nosocomial infection in patients.

Another study showed that male white coats were more contaminated than female[3]. However, in some studies it was found that female white coats were more contaminated than male[11,3]. Racheal Rettner showed that, full sleeves are more contaminated than half sleeves[23]. In our study, specimen from half-sleeved white coats were collected more in number than full sleeved white-coat specimen; hence, maybe they were found to be more contaminated than full-sleeved white coats. However, this data is not significant.

Most of the subjects (45%) preferred washing their coats twice a week, however 'plateau effect' (contamination reaching Constant steady state) occurs within a week; thereafter there is no considerable variation in contamination level[2,3,13]. In this study we found that white coats of subjects coming from hostels were more contaminated (55%) than those coming from home (45%). This is statistically significant [P=0.034]. In some studies, it was shown that in people residing at home, white coats were more contaminated than those who reside at hostel indicating risk of spreading HAI to community due to improper handling of white coats in homes and traveling[13]. Among the subjects who used the white coats for more than 2 hours (75.65%), the contamination rate was less than the subjects who wear it all time (78.57%). This may be due to the fact that some subjects did not believe that white coats could harbor potential harmful pathogens that may be risky. Hence they continued to wear white coats all the time during the service and thought that white coat was a dress code or fashion statement, in and outside the hospital premises.

In most of the volunteers who exchanged the white coats with other colleagues during the services, high (74.57%) contamination was found; indicating that continuous usage of white coats can harbor more potential pathogens and transfer cross infection to others. White-coats of volunteers which were having more stains were heavily contaminated (81.05%). This may be due to improper handling of syringes and blood products during the management of patients in wards, emergency services such as accidents, trauma cases etc. Regular washing with detergents and disinfectants can reduce the microbial load in white coats but sometimes the subjects forget to carry along and wash the white-coats regularly at home. Some hospitals arrange special services for laundering the white coats and keep an alarm system to remind the HCWs about washing their white coats in order to reduce the burden of microbial load in white-coats.

Indications do to improve the situation found; does not allow to carry white coats out of the hospital. Regular washing with detergents and disinfectants of the white coats should arrange by hospitals. Use 2 or more white coats will be reduce the microbial load and not allow multiple use or exchange of the white coats. Create awareness about HAIs to health care workers and infection control team of the hospital to maintain strict policy about the usage of white coats

CONCLUSION

Therefore, it can be concluded that white-coats are potential sources of cross infection. Yearly purchase of white coats and use of 2 or more coats for each person should be made compulsory. White coats should be washed at least once weekly by using a disinfectant and strong detergent. We must ban the use of white coats in non-clinical areas such a canteen, library etc.

In our study 73% of the white coats which were screened, were contaminated with bacteria. CONS (54.54%) were isolated most, followed by *S.aureus* (18.18%), *E.coli* (13.63%), *Klebsiella spp* (9.09%) and Pseudomonas spp (4.54%). 10 isolates showed MRS and most of the isolates showed resistance to at least one antibiotic.

Limitations

This study only evaluates the white coats of health-care workers. Further studies are required to evaluate the detailed levels of bacterial contamination of different fomites and mandate a strict audit process and protocols to be set in place for preventing the contamination.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTIONS

All the authors designed the experiments, performed the experiments, analyzed the data and wrote the manuscript. All the authors read and approved the manuscript for publication (AK, RAC and IS).

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ETHICS STATEMENT

This protocol was approved by Institutional Ethical Committee (IEC), D.Y Patil Medical College, Kolhapur.

DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript

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Deafness and Diabetes Mellitus : A Systematic Literature Review

Shailendra D Mane,[1] Rajashri Mane,[2] Balasaheb C Patil,[2] Jyoti Lakshmi,[2] Dharampal Bedwal[2]

ABSTRACT

Introduction

Diabetes mellitus cases are increasing worldwide. It affects almost all systems of the body including audio-vestibular system. Diabetic otopathy (DO) is the presence of symptoms and signs of vestibular and auditory disorders in patients with diabetes mellitus after the exclusion of other causes. In this review we aimed to study the mechanism of development of hearing loss in diabetes, the relationship between duration and severity of diabetes, and association of other complications with hearing loss.

Materials and Methods

We searched the MEDLINE & PubMed database using terms 'diabetic otopathy' and 'diabetes & hearing loss' for the articles published since 1970. Twenty articles were selected and reviewed.

Results

The mechanism of development of DO is not yet clearly known. But it is suggested to be multifactorial. This review of literature suggested that hearing impairment is two times more prevalent in subjects with diabetes as compared to those without diabetes. The relationship between diabetic otopathy and diabetic kidney disease is most commonly noticed.

Conclusion

The higher prevalence of hearing impairment in diabetic patients compared with nondiabetic patients was consistent. It is necessary to establish a screening and monitoring strategy for patients with diabetes mellitus to prevent the development of hearing loss and its consequences on life quality..

Keywords

Diabetes Mellitus; Diabetic Otopathy; Deafness

Diabetes mellitus (DM) is a metabolic disorder with uncontrolled sugar level which affects all systems of the body. According to the International Diabetes Federation (IDF), 463 million people in the world and 88 million people in the Southeast Asia region have diabetes in 2020. Out of this 88 million people in the Southeast Asia, 77 million belong to India.[1] As we know, Diabetes mellitus lead to development of several complications like retinopathy, peripheral neuropathy, nephropathy and accelerated atherosclerosis.[2,3,4,5] But what is not well known is, it may also lead to hearing loss. The reason may be that the patients with hearing loss visit ENT surgeon and not the physician who is treating their diabetes. Secondly it is not included in the list of complications of diabetes mellitus in any textbook till now.

Diabetic otopathy (DO) is defined by the presence of symptoms and signs of vestibular and auditory disorders in patients with diabetes mellitus after the exclusion of other causes. Its clinical manifestations include dizziness, vertigo, tinnitus and hearing loss.[6,7] Diabetic otopathy has an impact on the quality of life, affecting the communication and cognitive functions. In this review we aimed to study the mechanism of development of hearing loss in diabetes, the relationship between duration & severity of diabetes, and association of other complications with hearing loss.

1 - Department of Medicine, D.Y.Patil Medical College, Kolhapur, Maharashtra.
2 - Department of Otorhinolaryngology, D.Y.Patil Medical College, Kolhapur, Maharashtra.

Corresponding author:
Dr Rajashri Mane
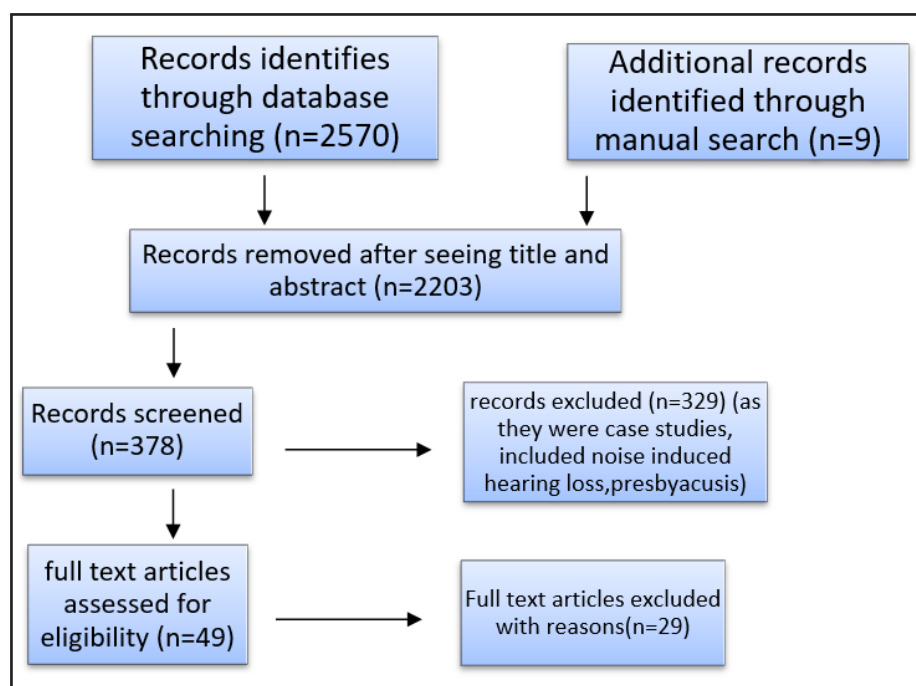email: manerajashri45@gmail.com

Fig. 1. Flow diagram of Data search done for this systematic review.

Materials and Methods

We made a review of the literature by searching the MEDLINE & PubMed database for the articles published since 1970. The search terms that we used were "diabetes otopathy" and "diabetes & hearing loss". Twenty articles published in medical journals were selected depending on following criteria (Fig. 1):

1) Observational study using a cross-sectional design,

2) Adult subjects included, and

3) Hearing impairment objectively assessed using pure-tone audiometry.

Review

Mechanism of development of hearing loss

The mechanism of development of DO is not yet clearly known. But it is suggested to be multifactorial.[8] The auditory neuropathy, microangiopathy of the cochlea and encephalopathy are thought to be the few factors responsible for development of hearing loss.[9,10]

The first mechanism described in the literature for development of hearing impairment in diabetes, is increased polyol pathway flux reported in 1977.[11] High blood glucose increases the intracellular accumulation of sorbitol which is an important chemical of the polyol pathway. Sorbitol slows down nerve conduction velocity[12] and is related to the immune, ischemic and metabolic changes seen in diabetes.[13] Aladag in 2009 reported that the protein oxidation as part of oxidative stress appears to be more important than lipid peroxidation in the pathogenesis of DO.[14]

Microangiopathy seen in diabetes is another factor responsible in the development of hearing loss. Increased glucose exposure initiates a metabolic cascade that could disrupt the cochlea both anatomically and physiologically. Studies have reported increased basement membrane thickening and porosity of the endothelium which is due to the upregulation of vascular endothelial growth factor and increased vascular permeability factor. This leads to changes in auditory electrolyte homeostasis within the endolymph and interfere with hair cell transduction and signal transmission. The cochlea contains Na/K/ATPase enzyme, but in diabetes, hyperglycemia down-regulates this enzyme, causing elevated intracellular Na+ and

extracellular K+ and Ca++.[15, 16]

One more factor responsible for hearing loss in diabetes is Nitric oxide. It plays a role in regulation of the vascular endothelium of the auditory system. The metabolic changes seen in diabetes impair the production of nitric oxide and cause vasodilatations. This limits blood supply to certain areas of the auditory organ.[17] Once ischemia sets in, excitotoxicity and apoptosis occurs, due to elevated intracellular Ca++ and damaged DNA.[18]

The metabolic changes of diabetes mellitus also results in deposits of collagen (advanced glycation end-products) in many areas of the peripheral auditory system.[19] This results in abnormal post-translational protein modifications, leading to difficulty in articulation of the hair cells and deficits in sound transduction.[18]

Endolymph is a medium wherein the intracellular environment depends on glucose for cellular function. Utilizing other substrates as alternative source of energy to maintain the endolymph during diabetes mellitus may be the one more important cause of hearing loss.[19]

Literature research and study characteristics

Table I shows details of the literature search done by us. Nineteen studies included both males and females but only one study involved males only. In a large number of included studies (14 studies), the mean age of participants was 60 yr or less. Eleven studies were done in Asian region and nine studies of other regions. In eleven studies, participants were hospital based, and in nine studies participants were from the general population. All studies described the method for assessment of hearing impairment as pure tone audiometry though the hearing threshold taken for deafness varied in different studies. But the threshold levels were almost consistent with that of hearing impairment defined by WHO. Most studies used 25 dB for the hearing impairment threshold with the exception of three studies that used 26, 30, and 20 dB, respectively, as the threshold. Fifteen of twenty studies identified the type of diabetes but the mean duration of diabetes was given in only nine studies.

Relation between duration & severity of diabetes and hearing loss

The association between hearing loss and diabetes mellitus was first reported by Jorden in 1857.[39] In 1864, the first scientific documentation connecting glucose metabolism disorders to inner ear diseases was done.[40] It showed the relation between sensorineural deafness and diabetes, thus establishing the link between hearing loss and hyperglycemia.

Kim et al have done the prospective cohort study on a large group of young adults and middle-aged men and women. These participants were subjected to regular auditory tests and screenings from 2002 to 2014. The conclusion was that the participants with normal glucose levels, pre-diabetes and diabetes mellitus have a rate of hearing loss of 1.8, 3.1 and 9.2 per 1000 person respectively. That means hearing loss was 7 times higher in diabetics as compared to non-diabetics.[39] Jin Lin also in his paper reported that number of type 2 diabetes patients suffered from hearing loss is much more as compared to pre-diabetes patients or the control group.[11] Recently in 2018, Cruickshank et al., reported that hearing loss is more common in patients with HbA1c >12.5%. This shows that a patient with uncontrolled sugar levels than the one with controlled sugar levels is more likely to be associated with the diabetic otopathy.[13] Similar study done in south India, in Karnataka by Dr Tiwari & Dr Mudhol showed that 76.8% diabetics in the age group 30 to 65 were suffering from sensorineural hearing loss irrespective of age 21. In the study done by Makwana et all in Jaipur, India Oct 2019, prevalence of mild sensorineural hearing loss was found to be 80%. According to them longer duration and uncontrolled diabetes are the factors which had higher risk of developing hearing loss.[20]

This review of literature suggested that hearing impairment in subjects with diabetes is two times more prevalent as compared to those without diabetes. The significant association between hearing impairment and diabetes was maintained throughout the analysis. It is well known that aging is associated with both prevalence of hearing impairment and diabetes. However, a stronger association was observed in studies of younger

Table I: Characteristics of studies included in this review

SI NO	AUTHOR	YEAR	COUNTRY	STUDY SETTING	TYPE OF DIABETES	MEAN DURATION OF DIABETES (YR)	AGE RANGE (YR) (MEAN)	PREVALENCE OF DIABETES %
1	Makwana AV et al.[20]	2019	India	Hospital	DM2	NA	55.5	80
2	Tiwari and Mudhol et al.[21]	2018	India	Hospital	DM2	>3	55.52	78.6
3	Yikawe, et al.[22]	2017	Nigeria	Hospital	DM2	7.81 ± 5.34	46.49	71.8
4	Jerico Gutierrez, et al.[23]	2016	Philippine	Hospital	DM 1 & 2	>5	57.52	45.31
5	Konrad-Martin et al.[24]	2015	US	Population	DM2	NA	47.7	NA
6	Krishnappa and Naseeruddin[25]	2014	India	Hospital	NA	NA	50-80	73.58
7	Kim M B et al.[26]	2014	Korea	Hospital	DM2	NA	44.1	NA
8	Bamanie et al.[27]	2011	Saudi Arabia	Hospital	T2DM	10.5	29-69	40.3
9	Mozaffari et al.[28]	2010	Iran	Population	9T1DM 71 T2DM1	9.3	20–60 (45.0)	36.3 21.2
10	Uchida et al.[29]	2010	Japan	Population	FPG _126 mg/dl, HbA1c _6.5%	NA	40–86	50.1
11	Cheng et al.[30]	2009	US	Population	NA	4.8	25–69 (44.3) 25–69 (44.9)	49.1
12	de Sousa et al.[31]	2009	Brazil	Hospital	NA	6.1	40– (50.5)	85.4
13	Aladag et al.[32]	2009	Turkey	Population	T2DM	NA	-46.9	57
14	Mitchell et al.[33]	2009	Australia	Population	T2DM	NA	55– (69.8)	42.9

Table I: Characteristics of studies included in this review

SI NO	AUTHOR	YEAR	COUNTRY	STUDY SETTING	TYPE OF DIABETES	MEAN DURATION OF DIABETES (YR)	AGE RANGE (YR) (MEAN)	PREVALENCE OF DIABETES %
15	Sakuta et al.[34]	2006	Japan	Population	T2DM	<10	51–59 (52.8)	39.5
16	Helzner et al.[35]	2005	US	Population	NA	>10	73–84 (77.5)	47.3
17	Huang.[36]	2004	China	Hospital	T2DM	NA	23– (56.1)	54.2
18	Dalton et al.[6]	1998	US	Population	T2DM	NA	43–84	43.3
19	Marumo et al.[37]	1984	Japan	Hospital	Primary DM	NA	18–75	72.8
20	Minami et al.[38]	1977	Japan	Hospital	NA	NA	15–79	61.1

participants (mean age of participants, approx 45 yr) compared with studies of older participants. This means that hearing impairment associated with diabetes is not dependent of age.

Several studies are published to analyze the link between diabetic complications and hearing loss. Tay in his survey showed that hearing impairment was correlated with the duration of diabetes, but not with other complications of the disease such as retinopathy.[40] Bayazit analysed hearing loss in patients with complications of diabetes in comparison with a group of patients without complications and concluded that diabetic neuropathy and encephalopathy are involved in etiology.[41] The relationship between diabetic otopathy and diabetic kidney disease is most commonly noticed. Dalton et al emphasized an association between severe diabetic nephropathy (patients with proteinuria, kidney transplant or dialysis) and hearing loss in their study. The glomerular filtration rate was used as an indicator of renal function and it was shown that hearing loss occurs from the early stages of chronic kidney disease.[42] Same results were demonstrated from a study conducted in Korea, that is patients with chronic renal disease stage 2 (eGFR 60-90ml/min/1.73m²) had a severe

auditory disorder. Independent of diabetes, lowering the glomerular filtration rate is associated with hearing loss of moderate severity among the analysed population. Hearing loss is not seen in non diabetic patients with severely reduced kidney function.[15]

In addition to above factors, the hearing loss caused by diabetes Mellitus is also affected by Triglyceride levels, Smoking & Alcohol consumption as stated below.

Conclusions

Current review suggests that the higher prevalence of hearing impairment in diabetic patients compared with nondiabetic patients was consistent regardless of age. The micro vascular lesions, atherosclerosis of the large vessels and even direct damage of the acoustic-vestibular nerve are the causes. Other elements that correlate with hearing impairment in DM are nephropathy, hypertriglyceridemia, increased alcohol consumption and hypertension. The influence of glycemic control (HbA1c) on hearing is uncertain. It is necessary to establish a screening and monitoring strategy for patients with diabetes mellitus to prevent the development of hearing loss and its consequences

on life quality.

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