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National Board of Examination (NBE)
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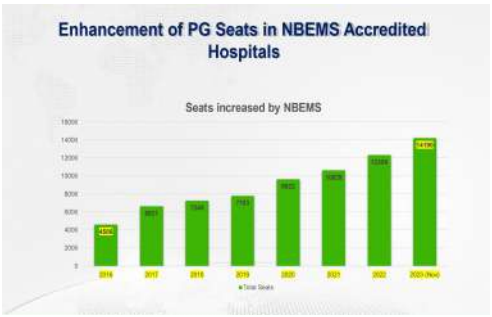
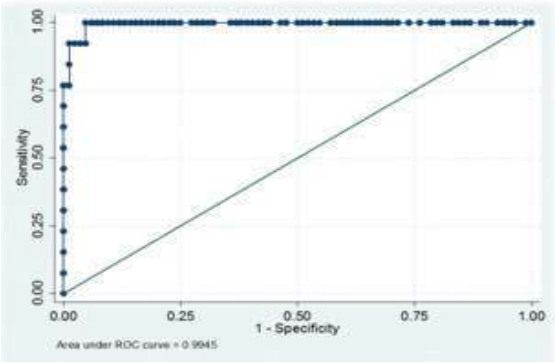
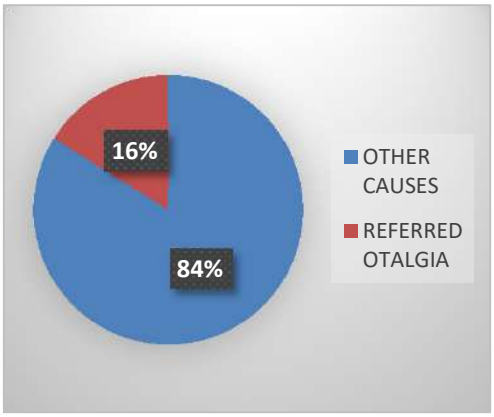


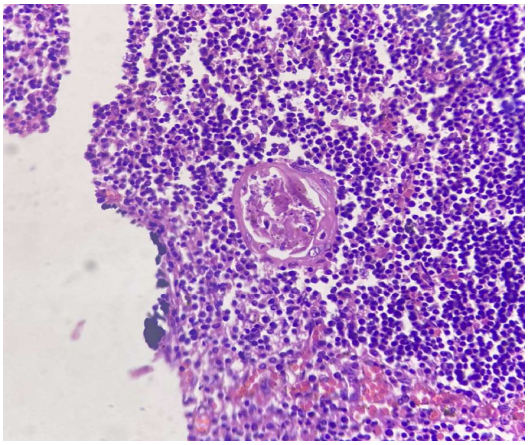
Enhancement of PG Seats in NBEMS Accredited Hospitals



ROC curve for P-POSSUM score



Graphical representation of cases of Referred Otalgia in OPD



Photomicrograph of HPE Lung

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ACKNOWLEDGEMENT TO REFEREES

Acknowledgement to Referees

Dear Reader,

Welcome to the first issue of *National Board of Examinations – Journal of Medical Sciences (NBEJMS)* for 2024.

We would like to start by thanking the authors of the articles published in *National Board of Examinations – Journal of Medical Sciences (NBEJMS)* over the course of 2023. The skill and dedication of these experts is critical to the continued success of the journal.

The quality of published articles is also testament to the significant efforts of the peer reviewers, whose commitment ensures that the journal's content is held to the highest possible standard. We would like to thank the following individuals who acted as reviewers for *National Board of Examinations – Journal of Medical Sciences (NBEJMS)* in the last 12 months:

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Anuradha Calicut Kini Rao
Pampa Toi
Sudarshan Srikanth

We are also extremely grateful to the members of the journal's Honorary Editorial Board, who have acted as peer reviewers and authors, and have provided guidance on journal content.

The editorial program for 2024 is well under way, and we are looking forward to continuing to bring you many high-quality and authoritative articles in the field of Medical Sciences over the coming year. Print has become much less important in publishing, hence our publication mode always will be E-Only.

Best wishes

Minu Bajpai and Abhijat Sheth

Editors-in-Chief, *National Board of Examinations – Journal of Medical Sciences (NBEJMS)*

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EDITORIAL

Global Medical Education: The Bharat vision

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At the 27th Tripartite Annual Executive Committee Meeting of the World Organization (OIE), the WHO Director-General emphasized that future pandemics can be prevented only with an integrated One Health approach. This should be done by taking global partnerships to a new level.

The COVID-19 pandemic has reinforced the idea that a holistic and collaborative approach to health is essential. By recognizing the inter connectedness of human, animal, and environmental health, the global community can better prepare for and respond to future health challenges. "One World, One Health" encapsulates the idea that the well-being of all living beings is intricately linked and requires a unified effort to safeguard and promote health worldwide.

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To standardize medical education, it is crucial to work towards aligning Indian medical education standards with global benchmarks, ensuring compatibility and recognition of Indian medical degrees worldwide. We are constantly strengthening the mechanisms that enable our participation in international accreditation processes to enhance the credibility of Indian medical education.

Health workforce challenges

The world has to grapple with several healthcare challenges in the future.

It has been estimated that by 2030 there would be a shortage of 18 million health care workers (1.8 crore) worldwide, with the shortage of doctors alone being approx. 50 lakhs.

This statement refers to a projected shortage of healthcare professionals by the year 2030. Workforce shortages in healthcare, including doctors, nurses, and other professionals, can have significant implications for the ability to provide

adequate medical care. It is essential for governments and healthcare systems to anticipate and address these shortages through strategic planning, training programs, and policies to ensure a sufficient and skilled workforce [1].

The health sector's impact on the global economy is expected to reach 12 trillion dollars by the year 2040. The health sector is a substantial contributor to national and global economies. Factors such as healthcare spending, medical research, pharmaceuticals, and related industries all contribute to the economic impact of the health sector. A growing health sector can positively influence economic development but also present challenges related to costs and resource allocation.

The integration of Artificial Intelligence (AI) and Machine Learning (ML) into health applications is projected to contribute an additional 4 trillion dollars to the global economy within the next 10 years. The use of AI and ML in healthcare has the potential to enhance diagnostics, treatment plans, and overall efficiency in the healthcare system. However, it also raises ethical considerations, regulatory challenges, and the need for careful implementation to ensure patient privacy and data security.

Current status of the number of undergraduates & postgraduates

The current status of the number of undergraduates and postgraduates globally shows a deficiency. In the USA, 30,000 to 35,000 new medical graduates and 85,000 postgraduates are produced annually. In India, these figures are: about 1,10,000 Undergraduates (UGs) per year in 700 medical colleges and 65,000 Postgraduates (PGs) every year distributed over medical colleges and hospitals across the country.

Overall, there is a projected deficit of 5 million doctors compared to the societal demand. This projected shortage emphasizes a concern about the adequacy of the healthcare workforce to meet the growing healthcare needs of societies globally. Factors contributing to this shortage can include population growth, aging populations, and the increasing burden of chronic diseases. In both countries, the balance between the number of medical graduates and available postgraduate positions is a critical consideration. The ratio of postgraduate seats to medical graduates in India is highlighted as less than 1:1, indicating potential challenges in providing specialized training opportunities for all medical graduates. It is important to note that these figures provide a snapshot of the current state. Addressing healthcare workforce challenges requires a multifaceted approach, including policies for education, training, retention, and distribution of healthcare professionals based on societal needs. Additionally, workforce planning should consider factors such as geographical distribution, specialties, and the evolving healthcare landscape.

Rural India

India is looking to cater to the shortage in rural India. The top 10 causes of death cannot be treated by MBBS alone. We need to address specialist deficiencies.

The top 10 causes of death in rural India require specialized medical attention beyond what can be provided by general practitioners with an MBBS degree. The emphasis on catering to the shortage in rural India indicates a recognition of the

disparities in healthcare access between urban and rural areas. Rural areas often face challenges in attracting and retaining specialized healthcare professionals, leading to a deficiency in comprehensive healthcare services.

In rural settings, access to specialized medical care may be limited, making it crucial to develop strategies to address this gap. Implementing programs to train healthcare professionals, including specialists, with a focus on rural healthcare needs. Encouraging and incentivizing specialists to work in rural areas is essential. Investing in healthcare infrastructure in rural areas, including the establishment of well-equipped primary health centers and district hospitals, can create a conducive environment for specialists to work and serve the rural population.

Low cost, high quality medical education

Several Indian states offer low-cost, high-quality medical education, e.g., Kerala, Karnataka, Chhattisgarh, etc.

India indeed has a unique infrastructure for providing low-cost medical education compared to many other countries. India has a considerable number of government-run medical colleges that offer education at subsidized rates. These institutions receive financial support from the government, enabling them to provide medical education at a lower cost compared to private institutions. The admissions process for medical courses in India is highly competitive and primarily based on merit. National-level entrance exams determine admission to medical colleges. This merit-based system helps ensure that deserving students have access to medical education, irrespective of their financial background. Many state governments regulate the fees charged by private medical colleges to prevent excessive charges. In certain states, medical graduates may be required to serve in rural or underserved areas for a specified period as part of their commitment to society. This approach aims to address healthcare disparities and ensure that medical professionals are distributed across the country, including in remote regions. Various government scholarships and subsidies are available to support students pursuing medical education. These financial aids further reduce the overall cost burden on students.

While India's infrastructure for low-cost medical education has several positive aspects, challenges such as a high demand for medical seats, resource constraints, and the need for continuous improvement in the quality of education still exist. Nevertheless, the efforts made to make medical education more accessible and affordable contribute to the unique landscape of medical education in India.

National Board of Examination in Medical Sciences' (NBEMS) Joint Accreditation scheme:

To utilize the available resources of hospitals and to provide them with an opportunity to give PG training, Joint accreditation of the hospitals has been approved by the Governing Body, NBEMS in its meeting dated 25.11.2022.

The objectives of the Joint Accreditation scheme

Resource Utilization, Case Load, and Case Mix Distribution, Upscale the quality of the training programme & Financial Sharing.

To begin with, for the initial year/s the concept of Joint Accreditation shall only be

limited to Broad Specialties. In this scheme, four types of different institutions can collaborate for the purpose of Joint Accreditation:

i. Govt. Hospital to Govt. Hospital
ii. Private to Govt. Hospital
iii. Private to Private Hospital
iv. Standalone Imaging/Diagnostic Lab Centres along with a Hospital

The institutions that cannot participate are those that are already running the NMC courses.

The National Board of Examinations in Medical Sciences (NBEMS) has the primary mandate of filling the specialist gaps in the country. Over the years, NBEMS has come up to expectations and there has been a steep rise in seats (Figure 1). Presently, there are 14,190 PG seats distributed over 1,339 hospitals (Figure 2).

India has about 70,000 hospitals. In the first phase of expansion, we anticipate additional engagement with 10% of this hospital pool, which would add 7000 more hospitals participating in the accreditation process. As a result, there is a potential to add 75,000 PG seats. This would be possible due to the mandate from the Govt. and NMC to NBEMS to engage with private hospitals. In addition to broad and specialty courses, NBEMS also has diplomas and fellowships (Figure 3).

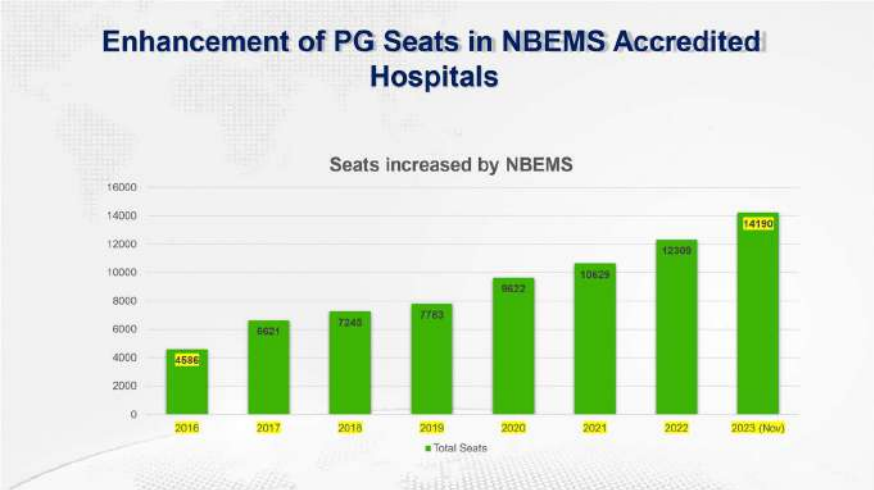

Figure 1. Enhancement of PG Seats in NBEMS Accredited Hospitals

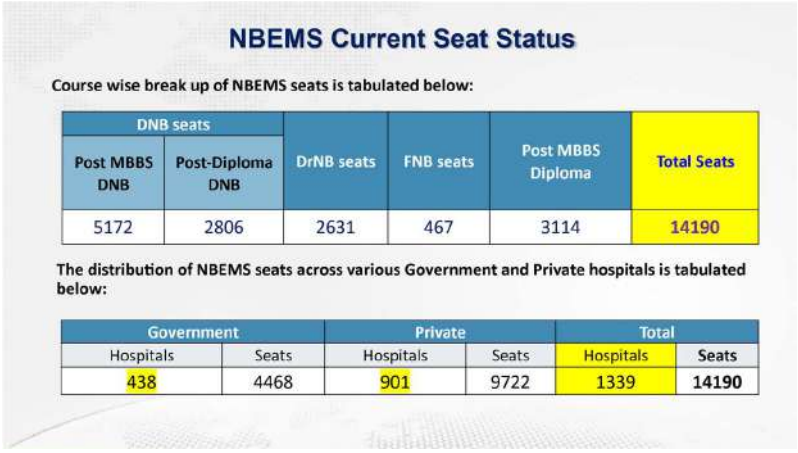

Figure 2. NBEMS Current Seat Status

Figure 3. Courses Offered by NBEMS

Undergraduate seats are the denominator for specialist seats. NBEMS has proposed to increase the UG seats by facilitating MBBS seats in private hospitals.

Simply increasing the number of PG seats without corresponding increases in the number of UG seats is not a comprehensive solution to address the shortage of doctors in India. It is important to increase both UG and PG seats simultaneously to ensure that there is an adequate number of trained doctors at all levels of the healthcare system. There are several reasons why increasing the number of UG seats is important.

1. It will increase the number of students who are eligible to pursue higher medical education and specialize in various medical specialties.
2. It will help to address the shortage of doctors in rural areas and underserved regions, where the need for healthcare professionals is greatest.
3. It will help to reduce the workload of existing doctors, thereby improving the quality of healthcare services provided.

Standards of teaching

In addition to increasing the number of UG and PG seats, it is also important to ensure that the quality of medical education is maintained. The curriculum and training provided to medical students must be relevant, up-to-date, and consistent with the latest medical practices and research. The accreditation process for medical colleges must be robust and stringent, and there should be regular monitoring and evaluation to ensure that the standards are being met.

Technology and innovation sharing of technological advancements and innovations in medical education

India has a strong Information Technology foundation through its world-class IITs. Collaboration with global partners would further help to develop and implement cutting-edge medical education technologies.

Education methods for learning

Improved standards of teaching & inclusive participation, blended learning and flipped learning approaches can play an important role in education by incorporating technology and non-traditional instructional methods. Blended learning combines traditional face-to-face instruction with online learning activities. It integrates technology and digital resources into the classroom, allowing students to engage in both offline and online learning experiences. In a blended learning model, students may have some control over the time, place, path, or pace of their learning.

Blended learning is being introduced by the NBEMS for the residents in-training. This is being done through a smart phone App for the PGs.

For the UGs, there are a variety of platforms that could be introduced—virtual class rooms, group discussions & debates in the library, and also through hybrid models of education.

Telemedicine and Tele-education

Leveraging India's expertise in telemedicine could contribute to global efforts to provide healthcare education remotely, especially in underserved regions. Sharing best practices and technological solutions will contribute to effective tele-education in the medical field.

Quadruple Aim

There is an increasing need to promote 'Quadruple Aim'**.** The quadruple aim of medical education is to:

a. Improving the care of individual patients,
b. Promoting the health of populations and
c. Lowering health care costs
d. Wellbeing of health care providers in order to be effective.

The Quadruple Aim is directed at the wellbeing of nurses, advanced practice providers, medical assistants, staff and anyone else involved in caring for patients.

Quality of care

Quality of care is measured based on **evidence-based professional knowledge** and is critical for achieving universal health coverage. Quality health care should be:

a. **Effective** – providing evidence-based healthcare services to those who need them.
b. **Safe** – avoiding harm to people for whom the care is intended.
c. **People-centred** – providing care that responds to individual preferences, needs and values.

Besides the Perineal platforms, such as collaborative research, international conferences, faculty & student exchange, they should continue to be strengthened.

Global Health Initiatives

Global health initiatives are needed, such as engagement in collaborative efforts for research and intervention programs in areas such as infectious diseases, non-communicable diseases, and public health.

Language and Cultural Competency Training

There is a need to develop programs that enhance the language and cultural competency of medical professionals, preparing them to work in diverse global settings. It would require the integration of

cross-cultural communication training into medical curricula.

Cultural competence in healthcare

Cultural competence in healthcare combines the tenets of patient- and family-centered care with an understanding of the social and cultural influences that affect the quality of medical services and treatment.

Global Health Diplomacy engagements

Finally, Global Health Diplomacy engagements would foster collaborations and partnerships with other countries and international organizations. These efforts contribute to international discussions on health policy, ethics, and healthcare system improvements.

Reference

1. Health workforce in India: where to invest, how much and why?. New Delhi: World Health Organization, Country Office for India; 2022.

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ORIGINAL ARTICLE

A Clinical Study on Hollow Viscus Perforation and Its Management in a Tertiary Care Hospital

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Abstract

Background: A common emergency of the abdomen with a significant morbidity and fatality rate is gastrointestinal perforation. In the treatment of perforation, surgery is important. Scoring systems are required for prognosis, comparing, and auditing surgical procedures.

Methods: A prospective study conducted at a single center with a sample of 100 individuals who had hollow viscus perforation was carried out. Investigations or a laparotomy were used to confirm the diagnosis. The death rate, anastomotic leak, dehiscence, infection, and respiratory issues, as well as hospital and intensive care unit stays were all followed prospectively over a 30-day period for all patients.

Results: Duodenal perforation was the commonest among hollow viscus perforations. The 20–40 age range was the most severely affected. Males suffer more than females. Complications can be avoided with a correct early diagnosis and suitable treatment. The site, size, age, and number of perforations all affect the surgical method. P-POSSUM and APACHE II scores were strongly correlated with outcomes such as post-operative wound dehiscence, respiratory issues, ICU stay, and hospital stay. When predicting mortality, POSSUM score was found to be superior to MPI.

Conclusions: Gastrointestinal perforations result in substantial morbidity and occasionally fatality. The most frequent reason for an acute abdomen requiring prompt, effective surgical intervention is hollow viscus perforation. Complications can be avoided with an accurate early diagnosis and sufficient treatment. The surgical strategy is determined by the perforation's location, size, age, and quantity.

Keywords: Abdominal emergency, Morbidity, Mortality, Clinical presentation

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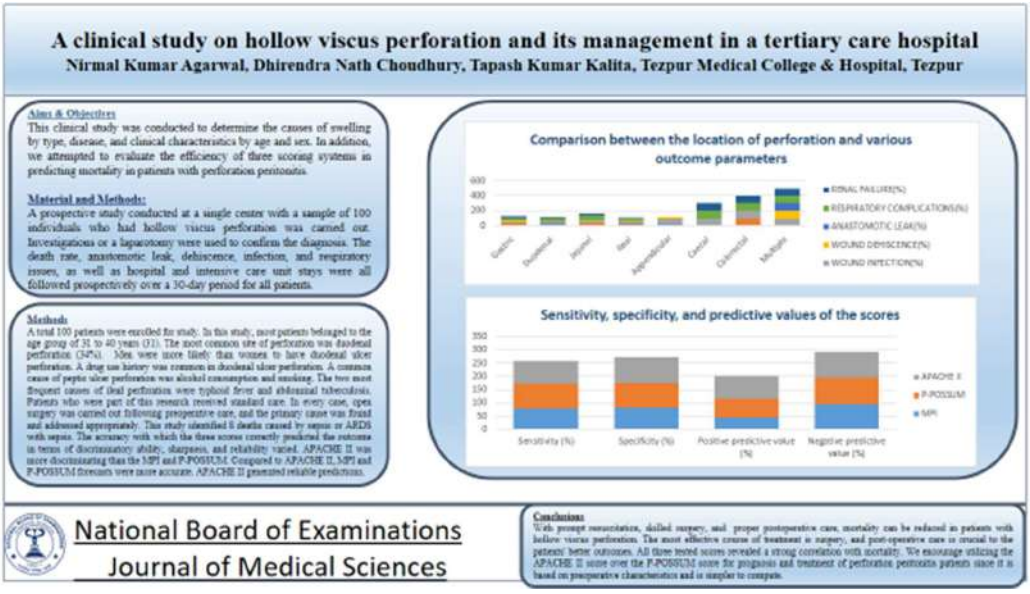
Graphical Abstract



Introduction

A serious abdominal emergency with a high fatality and morbidity rate is a perforation of the digestive tract. [1]. Patients frequently arrive later than expected, which delays intervention and raises morbidity and death [2]. The majority of problems from peptic ulcers result in perforation of the stomach and duodenum. Due to sepsis brought on by peritoneal contamination with mixed microbiology, gastrointestinal perforation has a significant mortality rate [3]. Treatment for peritonitis caused by hollow viscus perforation is complicated and involves critical care, surgery, and resuscitative measures [4]. Understanding prognosis and directing therapeutic response need early diagnosis and risk classification. For this reason, several scoring systems have been developed, including P-POSSUM, APACHE, the Mannheim Peritonitis Index, etc.

The twelve parameters that make up the Portsmouth - Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (P-POSSUM) score are based on physiological characteristics, past medical history of heart and lung conditions, and age. It was first defined in 1991. Additionally, it has six functional components. Portsmouth changed it since the first score exaggerated mortality [5]. Age, twelve physiological indicators, and points for chronic health make up the Acute Physiological and Chronic Health Evaluation II (APACHE II) score, which was originally published in 1985.

This clinical investigation was conducted to identify the etiological causes, incidence by age and sex, and clinical characteristics of different types of perforations. Additionally, it examines the typical types of perforations, their postoperative consequences, and their appearances. Finally, we attempted to assess how well three distinct scoring systems predicted the risk of death in patients suffering from peritonitis due to a perforation of the hollow viscus.

Methodology

In our investigation, an examination of 100 cases of abdominal hollow viscus perforations was done

prospectively. Cases were chosen at random from patients admitted to the surgery ward. Based on the history and physical examination, a clinical diagnosis of hollow viscus perforation was made, which was later supported by tests or a laparotomy.

Inclusion Criteria:

1. Patients older than 12 years of age.

2. Patients having a laparotomy or an investigation that confirms a clinical diagnosis of hollow viscus perforation.

Exclusion Criteria:

1. Age 12 years or younger.
2. Patients undergoing emergency explorative laparotomy due to other causes like abdominal trauma

A comprehensive clinical history was taken, detailing the symptoms for as long as they persisted, including fever, vomiting, changes in bowel habit, pain in the abdomen, and distension. It was determined if the patient has a history of co-occurring conditions such as diabetes and hypertension. Details about any important cardiac or respiratory history, invasive procedure history, drug use history, and personal history were recorded.

The patient underwent a general examination, which included measuring the patient's temperature, pulse, blood pressure, respiratory rate, and Glasgow Coma Scale (GCS).

The patient underwent a thorough abdominal examination, looking for discomfort, guarding, rigidity, and a palpable mass. The respiratory, cardiovascular, and neurological systems were all examined as part of the remaining systems.

All of the participants underwent routine blood examinations that comprised a complete hemogram, blood grouping and type, viral markers, renal function test, and a urinary albumin and sugar test. An X-ray plain picture abdomen erect was done to identify free gas under the diaphragm (lateral decubitus X-ray in unstable individuals). In suspected cases of intestinal perforations, a Widal test was performed. Additionally, CECT abdomen and Ultrasonography were done. Computed tomography of the abdomen was not performed on patients who had pyoperitoneum or open air under the diaphragm as shown on an erect abdomen x-ray.

Vital signs were carefully monitored in all cases and fluid and electrolyte balance was corrected before surgery. Blood cultures were taken and empiric antibiotics were started, then adjusted according to the culture and sensitivity report.

Exploratory laparotomy was performed in all cases under general anesthesia. A right paramedian, upper midline or lower midline incision was made according to the suspected perforation site. The internal organs were carefully inspected, the puncture site was identified and the corresponding surgical procedure was performed. Intraoperative findings of complete blood loss, perforation site, malignancy, and peritoneal contamination were noted. The peritoneum was washed with normal saline and the abdominal cavity was emptied. Postoperatively, patients were administered continuous nasogastric aspiration of intravenous fluids and antibiotics. Vital signs were observed. Parameters such as wound soakage, presence of bowel sounds, chest infections, postoperative shock, and postoperative stay were noted. Wound swab culture sensitivity was sent when indicated. Intake and output studies were conducted. The patient's recovery was observed and any complications

that occurred during the course were recorded.

Data regarding patient demographics, diagnosis, laboratory tests, surgical procedures, and outcomes were collected on case record forms. All these data were converted into a master chart and an individual assessment was made for each patient using the following scoring system (Figures 1-3). Individual scores were calculated for each patient. The accuracy of the scoring system was evaluated.

Quantitative techniques based on probabilities were used to evaluate the APACHE, P-POSSUM, and MPI scores' propensity to predict outcomes. As performance criteria, discriminatory ability, sharpness, and dependability were statistically assessed [6].

I. *Discriminatory ability*

What are the differences, as shown by the area under the receiver-operator characteristic (ROC) curve [7], between the percentage of correct predictions in the group of survivors (specificity) and the percentage of correct predictions in the group of non-survivors (sensitivity)?

2. *Sharpness*

How certain are the predictions?

3. *Reliability*

How well do mortality predictions and actual mortality match up?

Physiologic Variable	Points								
	+4	+3	+2	+1	0	+1	+2	+3	+4
1. Temperature (°C)	≥41	39-40.9		38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	≤29.9
2. Mean arterial pressure (mmHg)	≥160	130-159	110-129		70-109		50-69		≤49
3. Heart rate (/min)	≥180	140-179	110-139		70-109		55-69	40-54	≤39
4. Respiratory rate (/min)	≥50	35-49		25-34	12-24	10-11	6-9		≤5
5. Oxygenation (mmHg) a. A-aDO_2 if FiO_2 ≥0.5 b. PaO_2 if FiO_2 <0.5	500	350-499	200-349		<200 >70	61-70		55-60	<55
6. Acid-base balance a. Arterial pH b. Serum HCO_3 (mEq/l) if no arterial blood gas	≥7.7 ≥52	7.6-7.69 41-51.9		7.5-7.59 32-40.9	7.33-7.49 22-31.9		7.25-7.32 18-21.9	7.15-7.24 15-17.9	<7.15 <15
7. Sodium (mEq/l)	≥180	160-179	155-159	150-154	130-149		120-129	111-119	≤110
8. Potassium (mEq/l)	≥7	6-6.9		5.5-5.9	3.5-5.4	3-3.4	2.5-2.9		<2.5
9. Creatinine (mg/dl)	≥3.5	2-3.4	1.5-1.9		0.6-1.4		<0.6		
10. Hematocirt (%)	≥60		50-59.9	46-49.9	30-45.9		20-29.9		<2.5
11. White blood count (×1000/mm^3)	≥40		20-39.9	15.19.9	3-14.9		1-2.9		<1
12. Glasgow Coma Score (GCS)	Score = 15 minus actual GCS								
A. Total Acute Physiology Score (sum of 12 above points)									
B. Age points (years) ≤44=0; 45 to 54=2; 55 to 64=3; 65 to 74=5; ≥75=6									
C. Chronic Health Points*									
Total APACHE II Score (add together the points from A+B+C)									

* Chronic Health Points: If the patient has a history of severe organ system insufficiency or is immune-compromised as defined below, assign points as follows:
5 points for non-operative or emergency post-operative patients
2 points for elective post-operative patinets

Figure 1. APACHE II score [20]

Risk factor	Score
Age > 50 years	5
Female sex	5
Organ failure*	7
Malignancy	4
Preoperative duration of peritonitis > 24 h	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudates:	
Clear	0
Cloudy, purulent	6
Fecal	12

Figure 2: Showing Mannheim Peritonitis Index.

POSSUM score	1	2	4	8
Physiological parameters				
Age (years)	<60	61–70	≥71	
Cardiac signs	Normal	Cardiac drugs/Steroids	Edema/Warfarin	Raised JVP/cardiomegaly
CXR	Normal		Borderline cardiomegaly	Cardiomegaly
Respiratory signs	Normal	SOB exertion	SOB stairs	SOB rest
CXR	Normal	Mild COPD	Mod COPD	Any other signs
Systolic BP (mmHg)	110–130	131–170	≥171	≤89
		100–109	90–99	
Pulse rate	50–80	81–100	101–120	≥121
		40–49		
GCS	15	12–14	9–11	≤8
Hb (g/dl)	13–16	11.5–12.9	10–11.4	≤9.9
		16.1–17	17.1–18	≥18.1
WBC × 10^{12}/l	4–10	10.1–20	≥20.1	
		3.1–3.9	≤3	
Urea	≤7.5	7.6–10	10.1–15	≥15.1
Na^+	≥136	131–135	126–130	≤125
K^+	3.5–5	3.2–3.4	2.9–3.1	≤2.8
		5.1–5.3	5.4–5.9	≥6
ECG abnormality	Normal		AF (60–90)	Any other change
Operative parameters				
Operative magnitude	Minor	Intermediate	Major	Major+
No. of operations within 30 days	1		2	>2
Blood loss per operation (ml)	<100	101–500	501–999	>1000
Peritoneal contamination	No	Serous	Local pus	Free bowel contents, pus or blood
Presence of malignancy	No	Primary cancer only	Nodal metastases	Distant metastases
Timing of operation	Elective		Emergency resuscitation possible: operation <24 h	Emergency: immediate operation <2 h

Figure 3. P-POSSUM score [21]

Results

In this study, most patients belonged to the age group of 31 to 40 years (31) as shown in Table 1. Seventy seven patients (77%) were male and 23 female patients (23%) as shown in Table 2. The most common site of perforation was duodenal perforation (34%), followed by appendicular perforation (25%) as shown in Table 3. Men were more likely than women to have duodenal ulcer perforation, which happened in the first part of the duodenum (Table 4). A drug use history was common in duodenal ulcer perforation. A common cause of peptic ulcer perforation was alcohol consumption and smoking. The two most frequent causes of ileal perforation were typhoid fever and abdominal tuberculosis.

All of the appendix perforation cases in this study featured symptoms like fever, vomiting, and pain, but there was no gas under the diaphragm. All cases of duodenal ulcer perforation showed all the above signs (Table 5).
Patients who were part of this research received standard care. In every case, open surgery was carried out following preoperative care, and the primary cause was found and addressed appropriately.

This study identified 8 deaths caused by sepsis or ARDS with sepsis (Table 6).

The median duration of symptoms for patients who survived was two days, whereas those who died did so for 4.5 days. Eight of the 24 patients who were in stage three or higher septic shock died. There were 22 patients with multiple organ failure, defined as a creatinine level > 177 umol/L, urea level > 167 mmol/L, or oliguria (urine output <20 ml/hour), intestinal obstruction/paralysis, pulmonary dysfunction, and shock (systolic blood pressure < 90 mmHg, mean arterial pressure < 60 mmHg).

The average hospital stay for survivors was seven days, compared to 3.5 days for patients who did not survive. The fact that patients with severe illnesses and earlier deaths presented later can help to explain this.

The accuracy with which the three scores correctly predicted the outcome in terms of discriminatory ability, sharpness, and reliability varied (Tables 7 and 8).

Table 1. Age distribution of patients

AGE (in YRS)	No. of Patients	Percentage
<20	4	4
21 - 30	14	14
31 - 40	31	31
41 - 50	25	25
51 - 60	15	15
>60	11	11
Total	100	100

Table 2: Sex distribution of patients

SEX	No. of Patients	Percentage
Male	77	77
Female	23	23
Total	100	100

Table 3: Site of perforation

Site of Perforation	No. of Patients	Percentage
Gastric	4	4
Duodenal	34	34
Jejunal	14	14
Ileal	20	20
Appendicular	25	25
Caecal	1	1
Colorectal	1	1
Multiple	1	1
Total	100	100

Table 4. Relation between sex and site of perforation

Sex	Gastric	Duodenal	Jejunal	Ileal	Appendicular	Caecal	Colorectal	Multiple	Total
Male	4	29	11	12	13	1	0	1	71
Female	0	5	3	8	12	0	1	0	29
Total	4	34	14	20	25	1	1	1	100

Table 5: Signs and Symptoms at the time of presentation

Signs & symptoms	No. of Patients
Fever	65
Pain abdomen	98
Vomiting	80
Distension	86
Constipation	40
Diarrhea	5
Tenderness	100
Guarding	95
Obliterated liver dullness	84
Free fluid	54
Absent bowel sound	88
Air under diaphragm	89

Table 6. Comparison between the location of perforation and various outcome parameters

LOCATION OF PERFORATION	FREQUENCY	MORTALITY (%)	WOUND INFECTION (%)	WOUND DEHISCENCE (%)	ANASTOMOTIC LEAK (%)	RESPIRATORY COMPLICATIONS (%)	RENAL FAILURE (%)
Gastric	4	25	25	25	0	25	25
Duodenal	34	11	17.6	0	0	41.1	11
Jejunal	14	14	35.7	7.1	0	71.4	14
Ileal	20	10	25	5	0	40	10
Appendicular	25	0	72	16	0	0	0
Caecal	1	0	100	0	0	100	100
Colorectal	1	100	100	0	0	100	100
Multiple	1	0	100	100	100	100	100

Table 7. Showing median scores and area under ROC curves of the three scores

Scores	Survived	Died	p-value	AUC
MPI	23.5	32.5	0.0000	0.95
POSSUM	39	57.5	0.0000	0.99
APACHE II	10	24	0.0000	0.96

Table 8. Showing sensitivity, specificity, and predictive values of the scores.

Score	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
MPI	80	82	46	96
P-POSSUM	91.5	94	70.5	98.75
APACHE II	85.8	98.5	86.67	97.5

Discriminatory ability

Figures 4-6 display the ROC curves that correlated sensitivity to specificity for various cut-off settings. According to the APACHE II curve, it was more discriminating than the MPI and P-POSSUM. For instance, the sensitivity of P-POSSUM was 91% with a fixed specificity (for instance, 80%), which was higher than MPI (80%) and APACHE II (85%). Throughout the whole range of values, this distinction remained constant.

Sharpness

In the majority of cases, APACHE II provided modest predictions of mortality. Compared to APACHE II, MPI and P-POSSUM forecasts were more accurate.

Reliability

Comparing observed and predicted death rates allowed authors to examine the reliability. APACHE II generated reliable predictions.

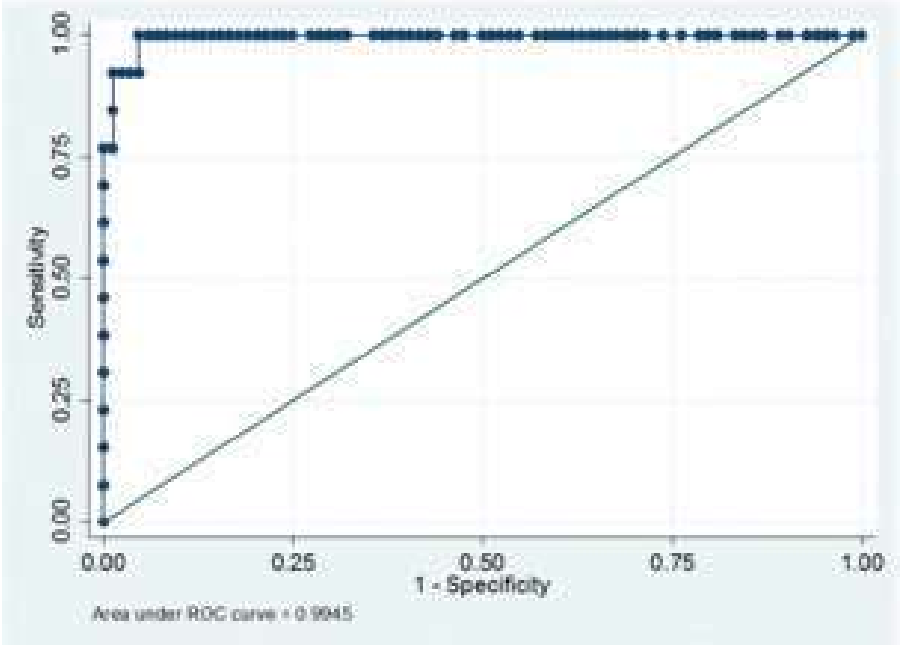


Figure 4. ROC curve for P-POSSUM score

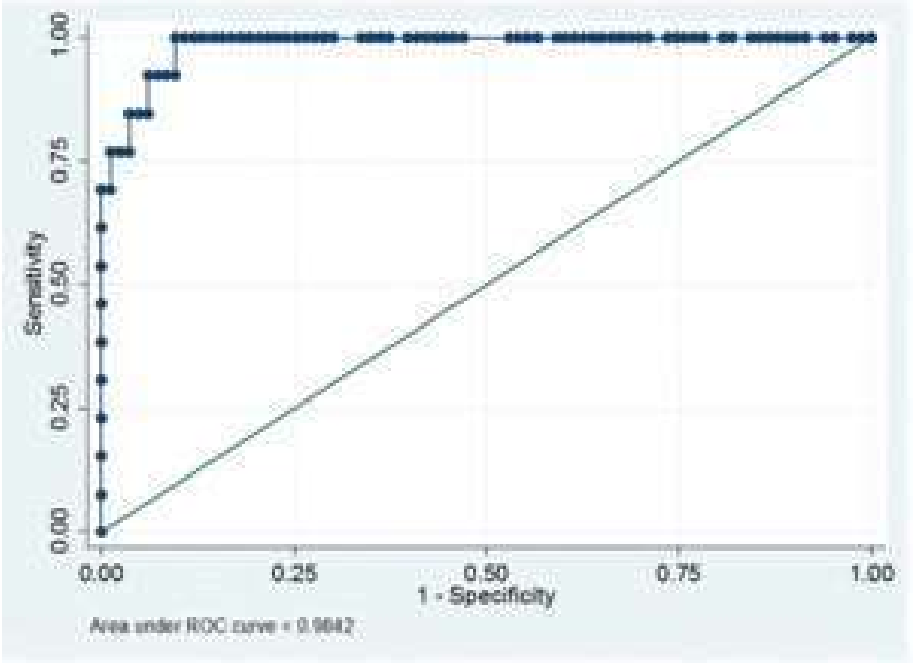


Figure 5. ROC curve for APACHE II score

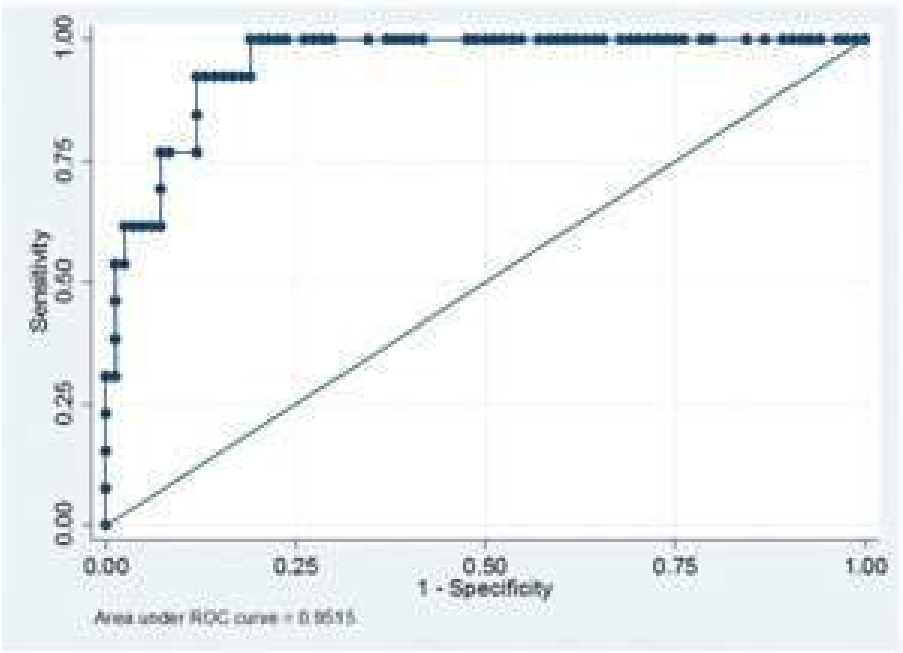


Figure 6. ROC curve for MPI score

Discussion

Perforation of the gastrointestinal tract is one of the main causes of abdominal pain in adults. Most patients with appendicular perforation have a history of constipation. Men are more likely to develop perforated duodenal ulcers, which typically happen in the first part. Additional reasons for gastrointestinal perforation included malignancy, iatrogenic injuries, acid reflux disease, enteric fever, amoebic colitis, and abdominal tuberculosis. Early diagnosis and urgent exploratory laparotomy improve outcomes. It has been found that smoking, alcoholism, and inadequate H. pylori treatment are major risk factors for duodenal ulcer perforation [8]. Abuse of NSAIDs is also a significant factor. Regardless of the pathology, the highest incidence was in men from 30 to 40 years of age. Treatment for ileocecal junction tuberculous perforation involved right hemicolectomy. An emergency appendicectomy combined with peritoneal lavage is sufficient in cases of appendicular perforation [9]. Today, iatrogenic perforations with minimally invasive or endoscopic procedures are common.

The majority of the deceased patients had severe illness. The median MPI value was 23.5 in survivors and 32.5 in deaths. A receiver operating characteristic (ROC) curve was used, and the results showed that the Mannheim Peritonitis Index is a useful scoring system for estimating death with the area under the curve being 0.95 [10 -15] [Figure 6]. The mean P-POSSUM score of survivors was 39 and the mean P-POSSUM score of deceased was 57.5. With an area under the ROC curve of 0.99, P-POSSUM score is good for predicting mortality (Figure 4) [16-19]. The area under the curve for the APACHE score was 0.96 (Figure 5). APACHE score is a good predictor of mortality. The ROC curve is used to determine the ideal cutoff value, which is the value that results in the highest level of score sensitivity and specificity. Plotting ROC curves involves the use of specificity and sensitivity. The Y- and X-axes are used

to plot sensitivity and specificity, respectively. Due to their inverse proportionality, the test's sensitivity and specificity vary at different points on the curve. APACHE II and P-POSSUM scores showed a strong correlation with death, however this study did not demonstrate the superiority of one score over the other. P-POSSUM overestimated mortality and had a marginally lower positive predictive value. In comparison to the previous two, MPI was less accurate in predicting the outcome (accuracy 82.8%), despite having a sensitivity and specificity of over 80%. MPI over predicted mortality as well, with a positive predictive value of 46%. Optimizing the cut-off point does not achieve an acceptably low false-positive prediction rate that would justify using the score for individual patient care [Table 8]. These findings indicate that the MPI (0.95) was not as good at predicting mortality as the P-POSSUM score, which had an area under the curve of 0.99 in patients with perforation peritonitis who underwent surgical treatment of the underlying disease. [Figure 4-6]. However, all three scores are good for predicting mortality. Considering the ease of calculating the score, the APACHE II score and Mannheim Peritonitis Index appear to be easier to calculate than P-POSSUM score.

Conclusion

With better preoperative resuscitation, more skilled surgery, and superior postoperative care, mortality can be reduced in patients with delayed presentation, older age groups, and related comorbidities. The most effective course of treatment for patients with perforation peritonitis is surgery, and post-operative care is crucial to the patients' better outcomes. All three tested scores revealed a strong correlation with mortality. The P-POSSUM and APACHE II did not significantly differ from each other in their ability to predict the aforementioned outcomes. We encourage utilizing the APACHE II score over the P-POSSUM score for prognosis and treatment of perforation peritonitis patients since it is based on preoperative characteristics and is simpler to compute.

Statements and Declarations

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Conflict of interest: None

Ethical approval
The Institutional Ethics Committee gave its clearance to the study.

Authors' contributions
The primary author, Nirmal Kumar Agarwal, has significantly influenced the concept and design. The manuscript was drafted with input from Dhirendra Nath Choudhury, Nirmal Kumar Agarwal and Tapash Kumar Kalita, who also critically evaluated it for significant intellectual value. Every author has committed to taking responsibility for every part of the work. Tapash Kumar Kalita is the corresponding author. The final manuscript was read and approved by all writers.

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ORIGINAL ARTICLE

"Growing Solutions: Evaluating the Impact and Viability of Poshan-Vatika in Combating Anemia among Pregnant Women and Adolescent Girls in Bhanvad Taluka, DevBhoomi Dwarka, Gujarat"

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Abstract

Introduction: Kitchen gardens, as small-scale vegetable cultivation areas within households, play a crucial role in providing a sustainable source of fresh and nutritious vegetables. This study forms a pivotal component of an innovation pilot project where kitchen garden intervention holds significant importance. The primary aim and objectives of this study revolve around assessing the effectiveness and feasibility of the kitchen garden intervention in addressing anemia among pregnant women and adolescent girls in Bhanvad Taluka of Devbhoomi Dwarka, Gujarat. By integrating the cultivation of vegetables within households, the study aims to contribute to improved nutrition and overall well-being in these specific demographic groups. **Materials and Methods:** The current study, conducted between June 2020 to March 2021, focused on Bhanvad Taluka of DevBhoomi Dwarka, Gujarat. Employing a mixed-method approach, the study targeted a sample of 60 pregnant women and 304 adolescent girls, selected through simple random sampling. Verbal informed consent was obtained from each participant to ensure ethical research practices. The evaluation team administered a semi-structured, pilot-tested questionnaire in the local language. Counsellors, including FHW/ MS/ FHS/ ASHA, actively participated in the project, contributing to the comprehensive nature of the study. **Results:** Severity of anemia got reduced due to the project interventions. Overall scenario among total beneficiaries at the end of project found that mild cases were increased and moderate cases got reduced while there no change among severe cases reported. **Conclusion:** The use of Kitchen Garden can promote awareness of the importance of a healthy diet and encourage the consumption of locally grown fruits and vegetables. However, further research is needed to evaluate the effectiveness and feasibility of Kitchen Garden as an intervention to address anemia among pregnant women and adolescent girls.

Keywords: Kitchen Garden, Anemia, Anganwadi centre, Pregnant women, Adolescent Girls, Counselors

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Graphical Abstract

Growing Solutions: Evaluating the Impact and Viability of Poshan-Vatika in Combating Anemia among Pregnant Women and Adolescent Girls in Bhanvad Taluka, DevBhoomi Dwarka, Gujarat

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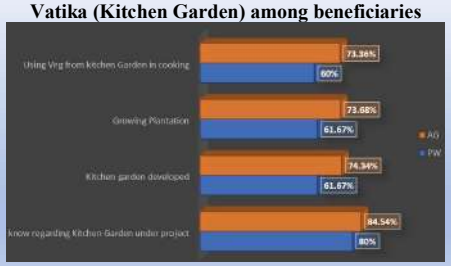
Aims & Objectives
To assess the effectiveness and feasibility of Poshan-Vatika (Kitchen Garden) intervention on anemia among pregnant women and adolescent girls in Bhanvad Taluka of Devbhoomi Dwarka, Gujarat.

Introduction
Kitchen gardens, as small-scale vegetable cultivation areas within households, play a crucial role in providing a sustainable source of fresh and nutritious vegetables. This study forms a pivotal component of an innovation pilot project where kitchen garden intervention holds significant importance. By integrating the cultivation of vegetables within households, the study aims to contribute to improved nutrition and overall well-being in these specific demographic groups.

Bar Chart showing Awareness regarding Poshan-Vatika (Kitchen Garden) among beneficiaries



Results: Severity of anemia got reduced due to the project interventions. Overall scenario among total beneficiaries at the end of project found that mild cases were increased and moderate cases got reduced while there no change among severe cases reported. **Conclusion:** The use of Kitchen Garden can promote awareness of the importance of a healthy diet and encourage the consumption of locally grown fruits and vegetables.

Material and Methods:
The current study, conducted between June 2020 to March 2021, focused on Bhanvad Taluka of DevBhoomi Dwarka, Gujarat. Employing a mixed-method approach, the study targeted a sample of 60 pregnant women and 304 adolescent girls, selected through simple random sampling. Verbal informed consent was obtained from each participant to ensure ethical research practices. Counsellors, including FHW/ MS/ FHS/ ASHA, actively participated in the project.

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Introduction

Anemia is a major public health concern in India, particularly among pregnant women and adolescent girls. According to a study conducted in the Devbhumi Dwarka district of Gujarat, the prevalence of anemia among pregnant and lactating women was found to be high [1]. Anemia during pregnancy can lead to adverse maternal and fetal outcomes, including preterm delivery, low birth weight, and maternal mortality [2] while adolescent girls are also at a higher risk of anemia due to poor dietary intake and menstrual blood loss [3]. As, iron requirement of the body increases during this period and resulting into anemia [3,4]. Poor iron content in body result into poor cognitive and motor development outcomes in children, can cause fatigue and low productivity and during pregnancy it is associated with poor birth outcomes like low birth weight, prematurity and death; in fact it can lead to maternal or perinatal mortality [5]. To address the issue of anemia among pregnant women and adolescent girls in Bhanvad Taluka of Devbhoomi Dwarka, Gujarat, a kitchen garden intervention is proposed. Kitchen gardens are small-scale vegetable gardens that can be grown in households, providing a source of fresh and nutritious vegetables. Several studies have shown that kitchen gardens can improve dietary diversity and

nutritional status. It is a cost-effective intervention to combat anemia at large scale. Poshan Vatika can play an important role in enhancing dietary diversity by providing key micronutrients through local fruits and vegetables. Poshan Vatika is a good example of convergent action on-ground. This is designed to address the issue of malnutrition through transparency, accountability, balanced diets, diet diversity and quality, greater grassroots involvement and last-mile delivery of services supported by key strategies, viz., corrective strategies to address nutrition related deficiencies, nutrition awareness strategies to develop good eating habits for sustainable health and well-being, strategies for communication and development of green eco-systems such as Poshan Vatika at or near Anganwadi Centres, wherever possible and in Government led schools and Gram Panchayat lands where benefits can easily be given to women and children [6,7]. It is to address the challenges of malnutrition in children, adolescent girls, pregnant women and lactating mothers through a strategic shift in nutrition content and delivery and by creation of a convergent eco-system to develop and promote practices that nurture health, wellness and immunity [6]. Current study is the part of the innovation pilot project in which Poshan Vatika intervention was very important component; thus, keeping this is mind the aim and objectives of this study was to assess the effectiveness and feasibility of poshan vatika intervention on anemia among pregnant women and adolescent girls in Bhanvad Taluka of Devbhoomi Dwarka, Gujarat.

Materials and Methods

The current study, conducted between June 2020 to March 2021 in Bhanvad Taluka of DevBhoomi Dwarka, Gujarat, is part of the innovation pilot Anaemia Project under ICDS. There were almost 3498 adolescent girls and 816 pregnant women registered in Bhanvad Taluka in June 2020 when baseline screening under the project was planned. Out of these, 3255 adolescent girls and 699 pregnant women were screened for anemia in June 2020. Out of these, 517 pregnant women and 3036 adolescent girls were found to be anemic, and all interventions under the project were directed to them. It was decided to take 10% of the sample of target beneficiaries under the project for evaluation, which came out to be 52 pregnant women and 303 adolescent girls in the Bhanvad Taluka. So for convenience, it was decided to include 60 pregnant women and 300 adolescent girls from various parts of Bhanvad Taluka for evaluation (Figure 1).

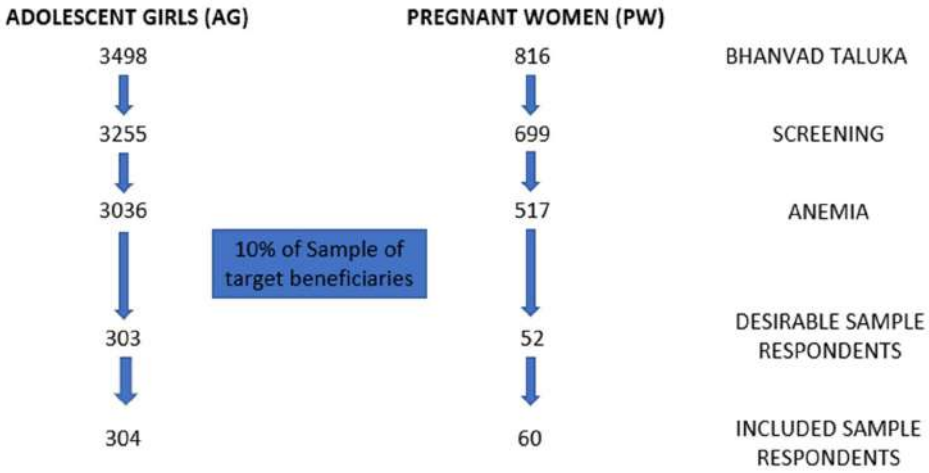

Figure 1. Sampling Frame and Sample

Utilizing a mixed-method approach, the study focused on 60 pregnant women and 304 adolescent girls, selected through simple random sampling. This initiative aimed to comprehensively address anemia and contribute valuable insights to inform future interventions and public health strategies. The inclusion criteria for the study encompassed individuals identified as anemic during baseline screening. Additionally, participants who demonstrated a willingness to provide consent were considered eligible for inclusion. This dual criterion aimed to ensure that individuals with a specific health condition, anemia, were included in the study, and that their active consent was obtained, emphasizing both health status and voluntary participation. The exclusion criteria for the study involved individuals who were not identified as anemic during baseline screening and those who did not express a willingness to provide consent. This twofold criterion was established to exclude participants who did not meet the specific health condition of anemia and those who chose not to participate voluntarily. By delineating these criteria, the study aimed to ensure a focused and willing participant pool, emphasizing the relevance of anemia status and active consent in the research. The study ensured ethical practices by obtaining Verbal Informed Consent from each participant and commenced after receiving approval from the institutional ethical committee. A semi-structured, pilot-tested questionnaire was administered in the local language by the evaluation team. Counsellors, including FHW/ MS/ FHS/ ASHA, played a pivotal role in the project. They underwent training before being instructed to provide counseling to beneficiaries at their respective premises. To monitor and assess the counseling services, the evaluation team conducted field visits, engaging with counsellors and beneficiaries, thereby ensuring the quality and effectiveness of the project activities. Nutrition awareness and affordability strategies in terms of Poshan Vatika aim to develop sustainable health and well-being through regional meal plans to bridge dietary gaps. This highlights the nutrient content of each plant and how they can help to address specific nutrition issues. Beneficiaries of the current study

were equipped with all the information needed to build their own Poshan Vatika from the shape of the garden, how to grow and harvest the plants, vegetables and fruits, to recommendations on medicinal crops.

The process of data entry was executed using MS Excel, and subsequent analysis was conducted utilizing the Statistical Package for Social Science (IBM SPSS Statistics version 26) along with MS Excel. The data was presented in terms of frequency, percentages, mean, standard deviation, and mean difference. Statistical significance in all analyses was determined by a p-value of <0.05, ensuring a rigorous approach to the interpretation of the results.

Results

In the current study, it was found that among Pregnant Women (PWs) that, both the number as well as proportion of anemia prevalence was reduced and it has been found that mild anemia (10-10.9 gm%) cases were more reduced at the end of the project. While the number and proportion of moderate anemia (7-9.9 gm%) among PWs remained almost same. While there was no case of severe anemia (<7 gm%) at the end of the project as compared to one case at the start of project among PWs. Among Adolescent Girls (AGs), it was found that there was more reduction of moderate type of anemia (8-10.9 gm%) at the end of the project while number and proportion of mild anemia (11-11.9 gm%) cases had been increased. It was also observed that one case of severe anemia (<8 gm%) was also increased at the end of the project. Above findings indicate that severity of anemia got reduced due to the project interventions. Overall scenario among total beneficiaries at the end of project found that mild cases were increased and moderate cases got reduced while there no change among severe cases reported.

The main aim of the evaluation of the innovation project was to assess the impact of various intervention done under the project on anemia status. The findings of anemia status among beneficiaries and its severity among them before and after the interventions are mentioned in Table 1. It was found that overall anemia burden among beneficiaries is reduced (9.34%). This reduction was more seen among PWs (18.33%) as compared to AGs (7.56%). We also found that as compared to base line screening findings, anemia prevalence had been decreased by 22.91%, 7.64% and 9.74% among PWs, AGs and both of them respectively at the end of the project.

It is observed that there is slight increase in the number as well as percentage of mean Hb level at the end of the project. There is slight change in mean Hb level and its variation among beneficiaries. As compared to base line mean Hb level findings, it is found that there is 4%, 6.02% and 5.64% rise in the percentage of mean Hb level respectively at the end of the project (Figure 2). Most of PWs (80%) and AGs (84.54%) know regarding kitchen Garden under the project. Out of total PWs, approx. 60% developed kitchen garden, had grown plantation and were using them. While approx. 74% AGs developed poshan vatika, had grown plantation and were using vegetables from it for cooking (Figure 3).

Out of all beneficiaries, almost 60% developed kitchen garden and had grown plantation and using them in their daily routine. Though, it was not developed in household of 39%. The major

reasons given by them for not developing kitchen garden were unawareness, no information, lack of space and eaten by cattle. No awareness and without any information and not developing kitchen garden reflecting communication gap from project level.

Out of total beneficiaries, 66% of beneficiaries are counseled regarding kitchen garden and 38.10% ofbeneficiaries are supported for development of kitchen garden in the form of mainly by giving seeds and education. As per response from counselors, most of the beneficiaries supported for kitchen garden are growing plantation and using vegetables for them (Table 2).

Table 1. Anemia burden among beneficiaries in Base line and End line screening

Anemia	**PW (n = 60)**		**AG (n = 304)**		**Total (n=364)**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Baseline	48	80.00	301	99.01	349	95.88
End Line	37	61.67	278	91.45	315	86.54
Decrease	11	18.33	23	7.56	34	9.34
% Decrease from baseline	22.91%		7.64%		9.74%	

Table 2. Findings of Poshan-Vatika by Counselor

	N=1029	**%**
No. of Beneficiaries counseled for Kitchen Garden	679	65.99
No. of Kitchen Garden developed	392	38.10
Growing Plantation	389	37.80
Using Veg in Project	387	37.61

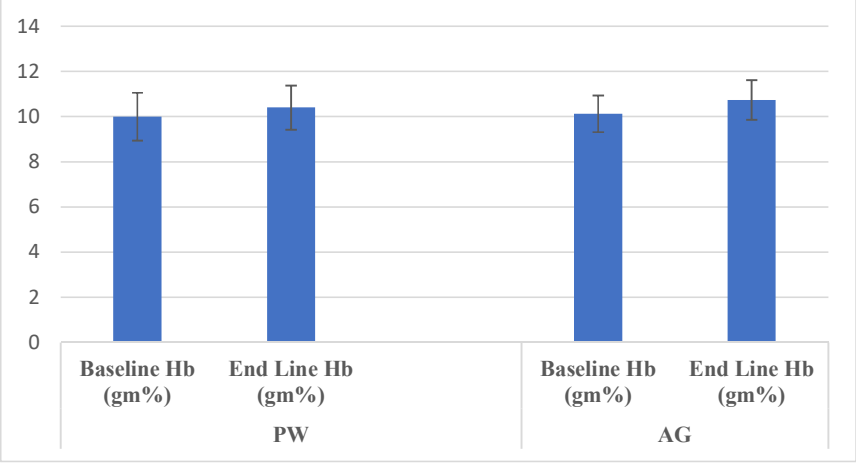

Figure 2. Mean (SD) Hb level among beneficiaries in Base line and End line screening

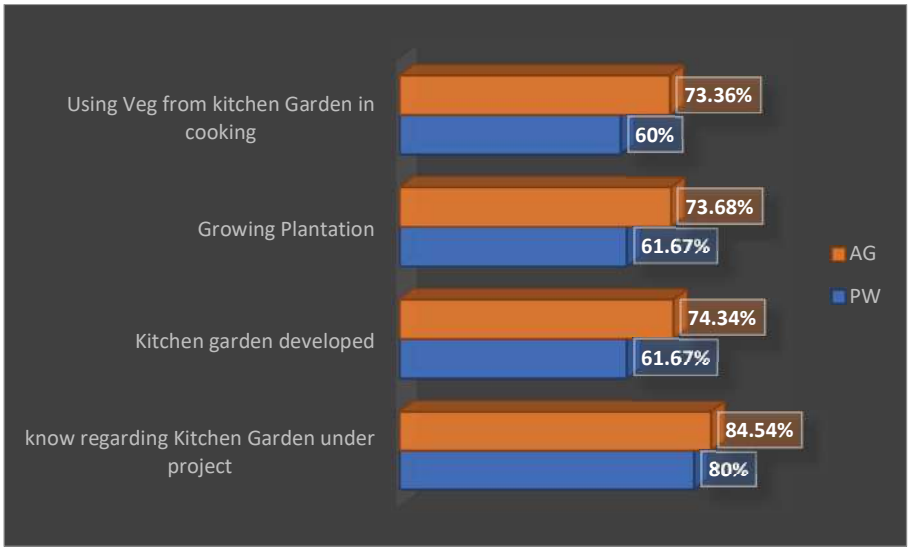

Figure 3. Awareness regarding Poshan-Vatika (Kitchen Garden) among beneficiaries

Discussion

According to the current study, there was a provision under the project for supporting and developing kitchen garden at AWCs, Beneficiaries Households, school etc. in Bhanvad Taluka. Support was given to AWCs for developing Kitchen Garden within premises of AWCs under the project like fencing, seeds, building wall, giving readymade "kyaras" etc. It was also observed that many beneficiaries have their own "Wadis" or Farms or Gardens in their own households and they are planting and growing vegetables, fruits and other items. As per interaction with them, many of them received support especially received seeds for developing kitchen garden (Poshan Vatika) under the project. As per Londhe et al. [8] primary focus of such intervention is to bridge the gap between easy affordability and scarcity. While in another study [9] kitchen garden in addition with supplementary nutrition could bridge the gap between recommended dietary allowance and the average daily intake. Other study [10,11] showed that the lack of resources being main factor to affect food and nutritional security at the remote area, resulting in micronutrient deficiency, particularly in children, pregnant and lactating women. So, Poshan Vatikas was very much essential in isolated places and villages far from main cities. As per Arimond et al. [12] dietary diversification which include home gardening was an effective strategy to improve nutrition in maternal and child under nutrition. Study done in villages of Odisha and Maharashtra [13] showed the favorable results in terms of improved diet diversity after promotion of nutrition gardens similarly study by Khan et al. [14] positive health and nutrition behavior change, improved nutrition and food preference in children improved after introduction of school garden. According to Michaux et al. [15] and Verbowski, et al. [16], all experimental households received seeds, seedlings as intervention to grow and came with conclusion that nutrition-sensitive agriculture programmes should be adopted to improve nutritional status in women and children over a period

of time. Whereas as per Peter R Berti et al. [17] agriculture interventions had mixed results in terms of improving nutritional status in participating households as there was difficulty in comparing the outcomes of interventions to distinguish between the effects of the type of intervention, having a nutrition objective and the types of capital investment, because of the fact that all of the home gardening interventions had an explicit nutrition objective as well as investing broadly in various types of capital, especially nutrition education (human capital).

Several studies have reported the effectiveness of Poshan Vatikas in improving hemoglobin levels among pregnant women and adolescent girls. A study [13] conducted in rural Maharashtra found that the use of Poshan Vatikas led to a significant increase in hemoglobin levels among pregnant women. Another study [18] conducted in a tribal area of Gujarat found that the use of Poshan Vatikas led to a significant increase in hemoglobin levels among adolescent girls.

Current study showed that majority of beneficiaries who did not grow plants in kitchen garden had lack of awareness and information regarding it while another study done at rural areas of Nanded district [19] most of the women (91.33%) were giving very less priority to household kitchen garden than their farm activities. However, 87.33% women reported the problem of unavailability of improved vegetable seeds and seedlings followed by lack of technical guidance (73.33%), improper water availability for garden (24%) and lack of family support (15.33%) were also problems faced by women while developing kitchen garden. Current study showed that approximate 80% beneficiaries were made aware through counselors regarding kitchen garden that how to grow plantation and regarding seeds and seedlings while According to Sudhakarrao [19] Around 18% women had knowledge about kitchen garden whereas, highest knowledge was observed on proper sowing time and season (50%) while as per Singh et al. [20] most of the beneficiaries did not have sufficient knowledge to grow and cultivate plants in kitchen garden while as per another study [6] development of Poshan Vatika at AWC might face challenges in the implementation, mainly related to the (a) time on the part of Anganwadi worker/helper or maintenance staff as they are already “overloaded” with other duties, (b) funding amount—Poshan Vatika will require considerable amount for procurement of seeds, cultivation/maintenance cost, fencing, etc., (c) support on the part of community or parents or volunteers, and (d) availability of space in the urban area.

Conclusion

In conclusion, the implementation of Poshan Vatikas in addressing anemia among pregnant women and adolescent girls in Bhanvad Taluka, Devbhoomi Dwarka, Gujarat, shows promise as a multifaceted intervention. These nutritional gardens not only combat anemia but also act as agents for heightened awareness regarding the importance of a healthy diet and the consumption of locally cultivated fruits and vegetables. Poshan Vatikas provide a sustainable reservoir of fresh, nutrient-rich produce, contributing to enhanced dietary diversity and improved nutritional well-being. The establishment of standardized mechanisms and pathways is crucial for comprehending how Poshan Vatikas can

positively influence community health. While existing studies indicate their efficacy in elevating hemoglobin levels, further research is imperative to evaluate the overall feasibility and effectiveness of Poshan Vatikas in addressing anemia among the target demographic. Continuous evaluation and research efforts will aid in documenting the seamless integration of these programs into Anganwadi Centers, ensuring a comprehensive understanding of their pivotal role in promoting community health and well-being.

Limitations and Recommendations

The evaluation adopted an exploratory study design for undertaking the quick assessment of the innovation pilot project. As the sample size was relatively lesser which included 14 AWC; higher sample size would increase external validity of the study. Multiple training sessions should be given to both counselors and beneficiaries as for changing behavior and life style modification needs time and motivation. Awareness regarding seeds, saplings, methods to grow and importance of Poshan Vatika should be given to the study population. Initiation and maintenance of poshan vatika was challenging as it requires considerable amount for procurement of seeds, cultivation/maintenance cost, fencing, etc. Also, support on the part of community or volunteers were needed and should be given at utmost priority. Proper space should be given at AWCs or at home of study population for growing plantation.

Conflicts of interest

The authors declares that they do not have conflict of interest.

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ORIGINAL ARTICLE

Exploring the Etiology of Referred Otalgia: A Comprehensive Study

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Abstract

Background: Ear pain, known as otalgia, has diverse origins, spanning from benign to severe conditions. Accurate diagnosis and treatment require an understanding of its etiology. Otalgia can be categorized as primary (ear-related) or referred (originating elsewhere). Referred otalgia poses unique challenges, as pain is perceived in the ear despite non-ear origins. **Aim:** The aim of present study is to investigate the potential causes of referred otalgia involving cranial and cervical nerves, and to explore the interplay between ear and distant body structures. **Materials & Methods:** A prospective study from March 2023 to June 2023 in an ENT OPD of Sharda Hospital, Greater Noida involved 360 patients. Evaluations encompassed dental, nasal, and head & neck assessments. Data included age, gender, side affected, and underlying cause statistical analysis was conducted using SPSS version. **Results:** Out of 360 patients, 16.1% had referred otalgia. Most were female (67.2%), and right-sided involvement was predominant (47%). Toothache (31.6%) and pharyngitis (29.1%) were the most common leading causes. Other causes included Gastroesophageal reflux disease, sinusitis, temporomandibular joint disease, cervical spine arthritis, and Bell's palsy. Two cases (0.5%) were associated with supraglottic and base of tongue malignancies. **Conclusion:** This study provides insights into referred otalgia's diverse origins, stressing the importance of comprehensive clinical evaluation for accurate diagnosis and tailored treatment. Collaboration among medical specialists is vital. Further research and clinical cooperation are needed to enhance our understanding of this complex condition.

Keywords: Pharyngitis, sinusitis, cranial nerve, Bell’s palsy

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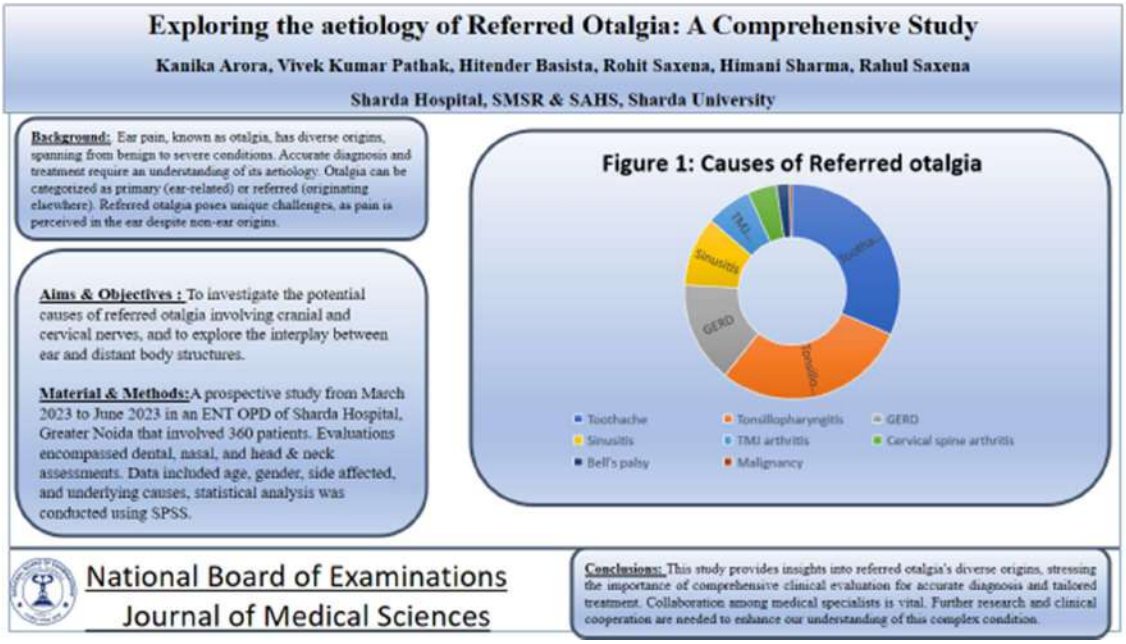
Graphical Abstract



Introduction

Otalgia, or ear pain, stands out as a common complaint that can result from variety of underlying conditions. Its etiology is vast and diverse, spanning from benign, self-limiting causes to severe, fatal illnesses. Understanding the origin of otalgia is imperative for accurate diagnosis& effective treatment, making it a subject of paramount importance in the field of otolaryngology. The cause of otalgia can be categorized as either related to ear issues (Otological) or arising from other sources, depending on the underlying pathology. While primary otalgia is directly related to the ear, referred otalgia presents a unique challenge in clinical practice. Referred otalgia occurs when pain is perceived in the ear despite its origin lying elsewhere in the body, making its diagnosis and management a complex and intriguing subject for medical investigation [1].

The auditory system derives sensory input from six different origins, and various structures in the head &neck also have shared nerve connections [2]. Consequently, issues arising in the neural network involving cranial nerves V,VII, IX and X that are Trigeminal Nerve, Facial Nerve,Glossopharyngeal Nerveand Vagus Nerve respectively, as well as Cervical spinal nerves C2& C3, may be potential causes of referred ear pain [3]. It's worth mentioning that children are more frequently affected by direct ear pain, whereas in adults, referred ear pain is more common [4]. The common causes of referred otalgia can be remembered as 5 Ts – Temporomandibular joint (TMJ), Teeth, Tongue, Tonsil and Throat.

The auriculotemporal nerve, which arises from the mandibular branch of the trigeminal nerve (V), conveys sensory information to the tragus, front portion of the ear, the anterior wall of the external ear canal, and the frontal area of the lateral tympanic membrane. Conditions such as temporomandibular joint disease and dental problems can cause referred ear pain via the auriculotemporal nerve [5].

The posterior auricular nerve, which is a division of the facial nerve, supplies sensory information to the rear wall of the external auditory canal, the posterior lateral area of the tympanic membrane, and the skin at the back of the auricle [6]. Referred ear pain originating from the facial nerve (VII) can manifest after an episode of herpes zoster [7].

Jacobson's nerve, a branch of the glossopharyngeal nerve (IX), is responsible for providing sensory input to the middle ear, the eustachian tube, and the inner surface of the tympanic membrane. Inflammatory conditions or lesions affecting the nasopharynx, palatine tonsils, soft palate, or the rear portion of the tongue can lead to referred ear pain through cranial nerve IX [8].

Arnold's nerve, which is a branch of the Vagus nerve (X), transmits sensory information to the lower and rear portions of the external auditory canal, the concha, and the side of the tympanic membrane. Conditions like thyroid abnormalities, laryngeal problems, and gastroesophageal reflux can result in referred ear pain through cranial nerve X [9]. Pathological conditions of the cervical spine (such as osteoarthritis, spondylosis, disc herniation, etc.) can manifest as referred ear pain through the greater auricular& lesser occipital nerves, which originate from C2 &C3 of the cervical plexus [10].

A CT scan of the temporal bone is the primary method used to examine issues related to the ear and temporal bone. When looking into problems concerning the pharynx, larynx, and other parts of the neck, using contrast-enhanced CT of the neck is usually most effective, although MR imaging is also useful and in certain cases might outperform CT for specific conditions [11].

This paper embarks on a comprehensive exploration of the etiology of referred otalgia through the various anatomical and physiological mechanisms that may result in referred otalgia. This paper sheds light on the intricate interplay between the ear and distant body structures. By examining the sources most likely to be implicated in origin of referred otalgia and the underlying neural pathways responsible for transmitting pain signals, we hope to enlighten medical practitioners with the knowledge necessary to differentiate between primary and referred otalgia, thereby facilitating more accurate diagnoses and tailored treatment strategies. Through an in-depth analysis of its etiology, we aim to offer a comprehensive resource that will aid healthcare professionals in the diagnosis, and management of this intriguing and often perplexing condition.

Materials & Methods

This is a prospective study carried out in March, 2023 to June, 2023 on patients visiting the ENT OPD of Sharda Hospital, Greater Noida.

The patients were evaluated thoroughly and those with normal ear examinations were included to be the part of this study. These evaluations encompassed assessments of the dental structures and temporomandibular joints, the nasal passages, the sinuses, and various areas of the head& neck. In cases where needed, the evaluations also involved direct and indirect laryngoscopy as well as biopsy procedures. Individuals with a recent history of tonsillectomy or other head & neck operations who subsequently experienced earaches were not included in the study.

Following the acquisition of written and informed consent from the patients, their data was documented. This data encompassed age, gender, season in which the patient presented, the affected side, and the underlying cause of the ear pain. Due to the diverse range of potential causes for referred ear pain, consultations with other medical specialties were sought when deemed necessary. Subsequently, the gathered data underwent statistical analysis using SPSS software.

Results

In the duration of the study 360 patients presented with earache, out of which 58 (16.1%) patients had referred otalgia (Figure 1).

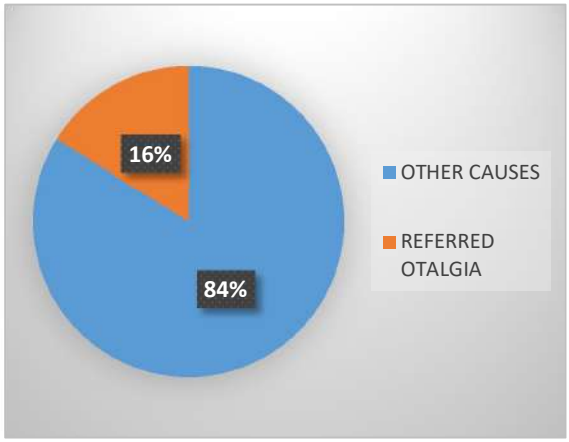


Figure 1. Graphical representation of cases of Referred Otalgia in OPD

Out of the patients experiencing referred otalgia, 39 (67.2%) were female, while 19 (32.7%) were male (Figure 2).

In regard to the side affected, 47% of cases experienced right-side involvement, while 44% exhibited left-side issues, and 9% had problems on both sides. (Figure 3).

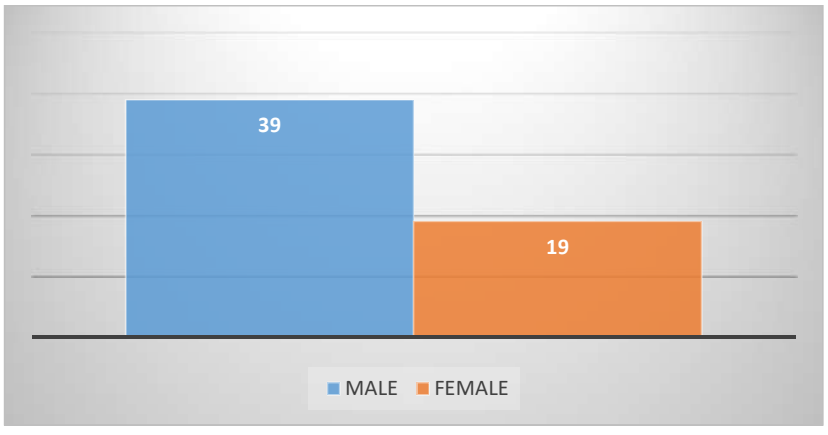


Figure 2. Gender wise distribution of patients of Referred Otalgia

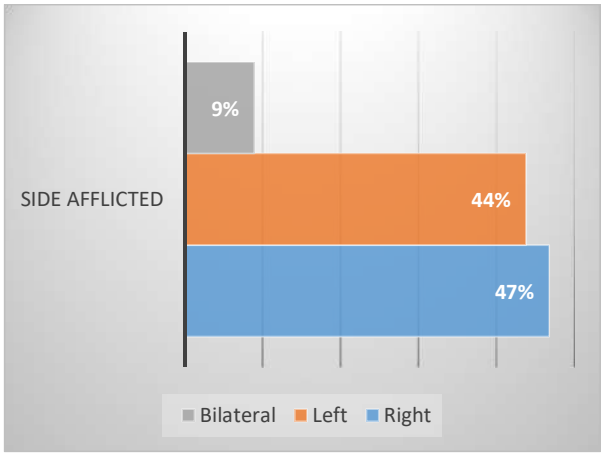


Figure 3. Graphical presentation of afflicted side of Referred Otalgia patients

Patients experiencing referred ear pain fell within the age bracket of 10 to 60 years, with the majority of cases occurring in the 21-30 age group. The average age among these patients was 26.3 years (Figure 4).

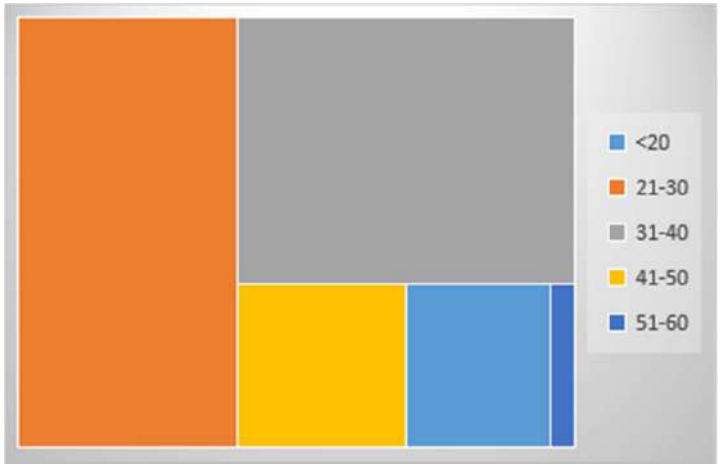


Figure 4. Distribution of patients on the basis of age group

Among the multiple causes of referred otalgia in our study, Toothache (31.6%) was the most common and pharyngitis (29.1 %) was 2nd most common.

GERD (15.2%), Sinusitis (10.5%), Inflammation of the temporomandibular joint, confirmed on clinical examination (6.9%), cervical spine arthritis, diagnosed by orthopaedic Department by X-Ray Neck (4.3%), Bell's palsy (1.9%) and were the other causes.

Out of 360, 2(0.5%) patients of referred otalgia were found to have supraglottic and base of tongue malignancy respectively, proven on biopsy later (Figure 5).

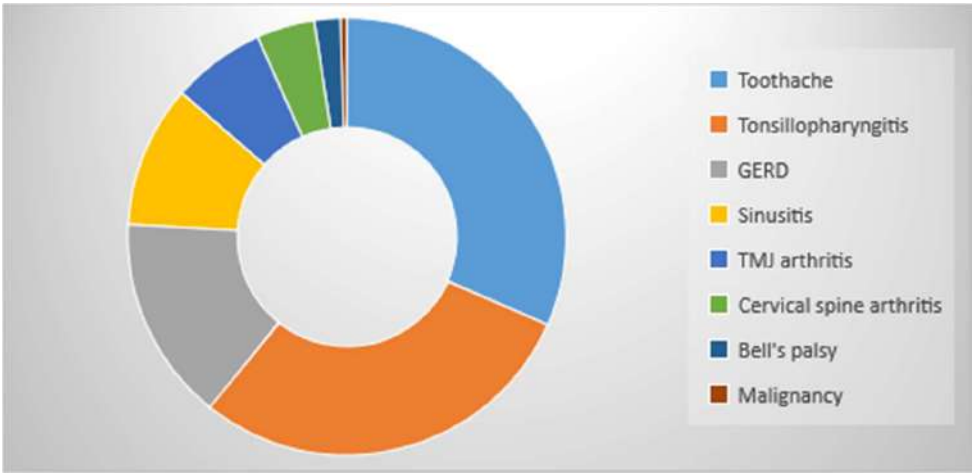


Figure 5. Various causes of Referred Otalgia

Discussion

The current study delves into the multifaceted realm of referred otalgia, shedding light on the diverse array of aetiologies contributing to this intriguing phenomenon. The incidence of referred otalgia in our study was 16.1%, emphasizing the significance of this condition in clinical practice, which was consistent with findings by Taziki M et al that showed 770 patients suffered from otalgia, 12.2% of whom had the referred type [12].

Gender disparity in referred otalgia was observed, with a predominance of female patients (67.2%). This disparity may reflect differences in healthcare-seeking behavior or predispositions to conditions that cause referred otalgia between genders. Kiakojoori et al. reported similar findings, with 40% of men and 60% of women, aligning with the results of our study [13].

Like the study published by Saraf A et al., which revealed right ear was involved in 53.8%, left ear in 35.3% and bilateral otalgia in 10.7%, Our findings also revealed interesting patterns regarding the side affected [14]. Nearly half of the cases (47%) exhibited right-sided involvement, while a slightly lower percentage (44%) experienced left-sided issues. The presence of bilateral problems in 9% of cases underscores the complexity of referred otalgia and highlights the need for a meticulous clinical evaluation to pinpoint its origin accurately.

Toothache emerged as the leading cause of referred otalgia in our study, accounting for 31.6% of cases. This finding aligns with research by Taziki M et al., according to which the most frequent aetiology of referred otalgia was found to be dental and TMJ pathologies due to their proximity to the ear and shared sensory nerve pathways [12].

Tonsillopharyngitis followed closely as the second most common cause at 29.1%, highlighting the connection between the throat and ear regions, where inflammation in the pharynx can lead to ear pain. Saraf et al. also found that 16.9% of patients had pharyngitis, and 10.7% had tonsillitis, which mirrors our study's findings [14].

Gastroesophageal reflux disease (GERD), sinusitis, temporomandibular

joint inflammation, cervical spine arthritis, and Bell's palsy were also identified as causes of referred otalgia, albeit less frequently. These findings emphasize the importance of a holistic approach to diagnosing ear pain, considering both local and remote etiologies. Notably, two cases of referred otalgia were associated with underlying supraglottic and base of tongue growths (0.5%). These findings underscore the significance of vigilance in assessing patients with otalgia, as they highlight the potential for serious underlying pathologies that may present with seemingly benign symptoms. In Dally's research, a single instance was reported where metastatic liposarcoma from the lower extremity had spread to the pharynx, presenting symptoms such as a sore throat and ear pain [15].

Similarly, in Reiter's study, there was a documented case of nasopharyngeal carcinoma that manifested as referred ear pain [16]. The comprehensive nature of this study, encompassing a wide spectrum of etiologies, reinforces the need for a multidisciplinary approach to the evaluation and management of referred otalgia. Collaboration between otolaryngologists, dentists, gastroenterologists, and other specialists is essential to accurately diagnose and treat this complex condition.

Karmacharya et al. concluded in their study that out of 607 patients with otalgia, 243(40%) had referred otalgia of this 39% were men and 61% were women. Commonest etiology of referred otalgia was dental causes followed by TMJ dysfunction. 3% patient had underlying malignancies. 37% had right earache, 42% had left earache and 21% had bilateral earache, the findings were very consistent with our study (17).

Conclusion

This study provides valuable insights into the aetiology of referred otalgia, emphasizing the importance of a thorough clinical evaluation, including dental and systemic assessments, to identify the underlying cause. Recognizing the diverse origins of referred otalgia is essential for healthcare professionals to formulate tailored treatment strategies and ensure optimal patient care. Further research and clinical collaboration are warranted to continue advancing our understanding of this intriguing and often perplexing condition.

Acknowledgement

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Conflict of interest

There is no conflict of interests. All authors are equally contributed.

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Ethics: The present study is ethically approved via letter no. SU/SMSR/76-A/2022/76

Authors Contributions

“Conceptualization, V.K.P. and R.S..; methodology, H.B.; validation, H.S., V.K.P. and R.S.; formal analysis, H.S.; investigation, K.A.; resources, H.S.; data curation, K.A.; writing—original draft preparation, K.A.; writing—review and editing, R.S.; visualization, R.S.; supervision, V.K.P.; project administration, R.S.

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ORIGINAL ARTICLE

A Knowledge, Attitude, and Practice (KAP) Study on Seating Preferences in Lecture Halls Among Second Year Medical Students

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Abstract
Background: The design and architecture of a lecture hall, along with students' seating preferences, the aesthetics of the space, and the ergonomics of classroom furniture, collectively influence a student's learning experience. Irrespective of the quality of teaching and high efforts put by instructors, it is a common trend among medical students to avoid sitting in the first rows of classes unless compelled to do so. The persistent challenge of encouraging students to occupy the front rows prompted us to address this issue systematically through a KAP study, aiming to investigate the underlying reasons in a scientific manner. ***Aims and objectives:*** The aims of this study are to discern the factors influencing students' avoidance of the first rows and their preference for alternative seating in lecture halls. The specific objectives include investigating the rationale behind favouring the last rows, identifying the types of lectures that students find most engaging, exploring the relationship between personality types and a preference for the back rows, and assessing perceived disadvantages associated with sitting at the rear. ***Methodology and Results:*** A semi structured questionnaire was used for data collection from second year MBBS students and a total of 158 students responded. Approximately 63.3% of students believe sitting in the last rows might have disadvantages, while others see no drawbacks. Most students (66.5%) prefer the middle rows for an optimal learning distance, feeling neither too far nor too near, and a sense of safety. The second choice is the last rows (13.9%) for freedom, comfort, creativity, and less distraction. The first rows rank third (12.7%) for being less distracting, increased interaction, and academic motivations (16.3%). ***Conclusion:*** In conclusion, our study finds that students prefer backbenches for comfort and ergonomic benefits, while avoiding front benches may be linked to distancing from authority figures. There's a preference for traditional teaching methods and some interest in small group sessions. Central rows are favoured for evading direct attention. This study pioneers understanding seating factors among medical students, suggesting avenues for future research.

Keywords: Medical education, Adaptive learning, Seating preferences, Learning environment, Traditional teaching methods.

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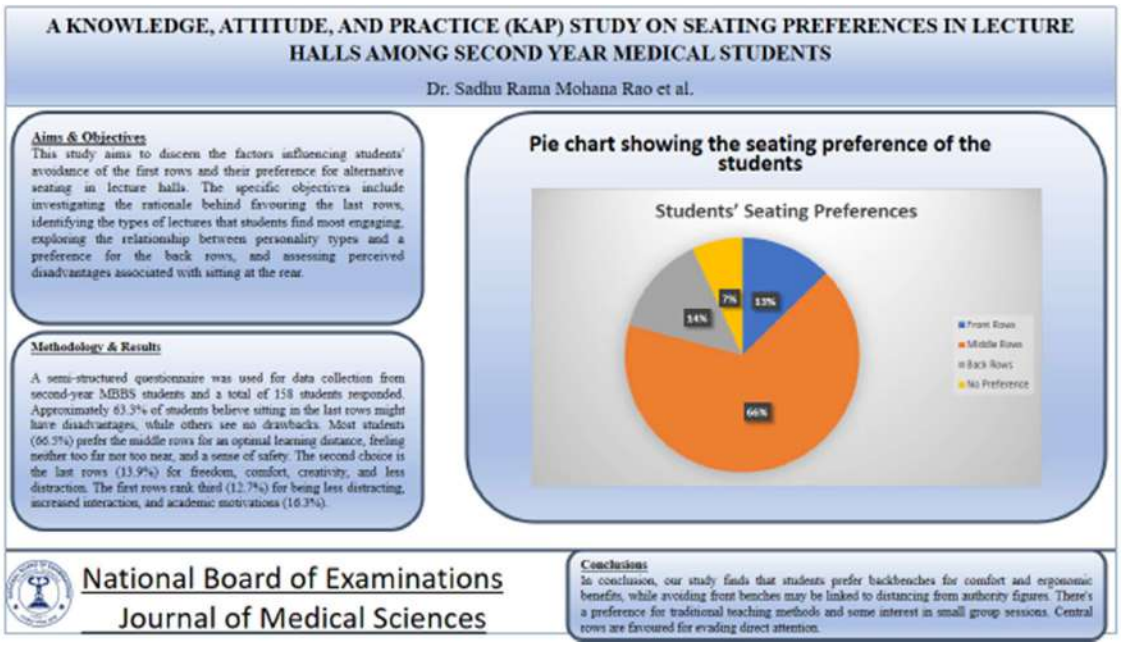
Graphical Abstract



Introduction

In the era of the post pandemic digital revolution, where learning can occur at one's own pace and time, and with the abundant availability of online platforms offering instruction for both university exams and competitive exams for joining postgraduate courses, traditional classroom teaching, particularly didactic lectures, is gradually losing relevance. Nevertheless, the National Medical Commission (NMC) mandates the inclusion of a substantial number of lectures in the undergraduate medical curriculum apart from small group discussions. While knowledge can be acquired through virtual platforms, physical lectures and bed side clinics serve as a means of imparting a wealth of practical experience in a structured manner with human touch. This parallels the distinction between watching a movie and attending a live performance, perhaps serving as a fitting analogy. We have consistently observed that medical students at our institute prefer to vacate the front rows of the lecture halls and attempt to secure seats towards the rear. We have contemplated conducting a scientific study to analyse this pattern and propose potential solutions.

Methodology

A brainstorming session involving several small groups of second-year medical students was conducted to explore the reasons behind their reluctance to occupy the front rows. Subsequently, the majority of students expressed their willingness to participate in the proposed research aimed at understanding these reasons in better fashion. It was revealed that they still perceive classroom contact teaching as an effective method that can enhance their exam performance and overall learning experience. Following a series of informal consultations with all stakeholders, a semi structured measurable questionnaire was prepared. The questionnaire was finalized after review by an expert member of the Medical Education Unit (MEU) at our institute, i.e. Andhra Medical College, Visakhapatnam, India. The self-answerable questionnaire was

administered to a batch of second-year professional students at our institute by creating a Google Form, and responses were recorded during the months of July to September 2023. Students of both genders of the age group 18-22 were part of the study.

This study aims to understand the reasons behind students' tendency to avoid the first rows and choose alternative seating in lecture halls. The objectives include investigating why students prefer the last rows, identifying the lecture types they find most engaging, exploring the connection between personality types and a preference for the last rows, and assessing any perceived disadvantages associated with sitting at the back.

The lecture halls under discussion deviate from the typical auditorium setup/gallery setup, featuring a large, ordinary hall with wooden benches placed uniformly on the same level. The audiovisual systems and acoustics of the lecture hall are of normal standard, and the seating type involved is in rows. The seating capacity of each lecture hall is about 125-150 students. About 125 students sit in each lecture hall in general.

The study aimed at analysing the student seating preferences pertaining to traditional lectures only, we did not attempt to study student seating preferences for Small Group Discussion (SGD) method of teaching.

Results

Out of the 250 students approached, only 198 students confirmed their willingness to participate in the study. Among them, only 158 students ultimately responded and provided consent for their information to be included in this publication.

For the question about preferred seating position in the classroom, among the 158 responses received, it was found that 66.5% of students prefer the middle rows, 13.9% prefer the last rows, and over 7% indicated no specific preference for their seating arrangement.

Approximately 63.3% of students expressed the belief that sitting in the last rows could have potential disadvantages. In contrast, the remaining students held the opinion that there was no evident drawback for them associated with such seating.

Among the 158 responses gathered, 46.8% of students stated that sitting in the last rows does not have any impact on their academic performance. A smaller percentage, 12%, indicated that their academic performance is affected when sitting in the last rows. The remaining 41.1% mentioned that there are only certain situations when their academic performance is influenced by this seating choice.

56.3% of respondents answered affirmatively to the question of whether they have ever been asked by a teacher to change their seat. The reasons for the seat change requests by the teacher are multiple which include the student disturbing others, not paying attention to the class, talking too much, using phone etc.(students selected multiple of these options)

Among the 158 students surveyed, 22.2% believed that assigned seating arrangements in lecture halls could enhance academic performance, while 45.6% expressed the view that such arrangements offer no discernible benefit. Additionally, 32.3% of students were uncertain about the advantages of assigned seating in lecture halls. The answers to the secondary questions under this question are shown in the Figures 1 and 2.

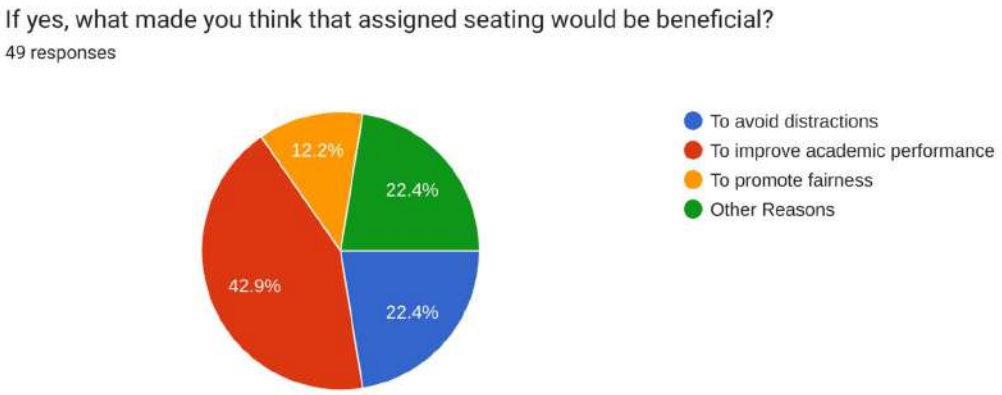


Figure 1. Showing reasons why students wished to have assigned seating in classrooms.

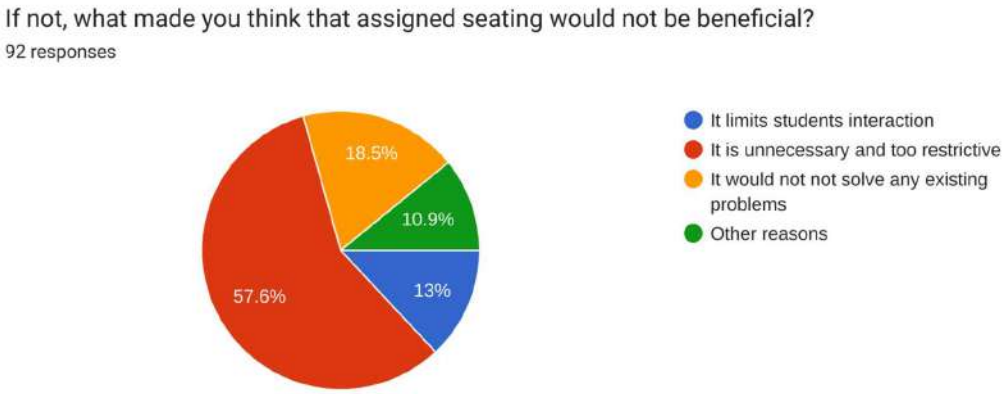


Figure 2. Showing reasons why students wished not to have assigned seating in classrooms.

In response to the question regarding whether the seating arrangement affects relationships with classmates, out of 158 responses, 46.2% indicated that it would affect their relationships, 36.1% stated that it would not have an impact, and 17.7% responded that it might occasionally or very rarely affect their relationships.

In response to the question on whether sitting in last rows effects their learning, 39.9% replied in negative, 12.7% replied in positive, and 47.5% replied that it depends on the subject and the teacher, and they don't have a simple answer for the question.

The reasons for choosing to sit in different areas of a lecture hall were as varied and interesting. Most of the students opined that there are always more than one reasons for their choices. However, 7% of the students did not have any particular preference as mentioned above.

Students' seating preferences are predominantly directed towards the middle rows (66.5%). The key factors influencing this choice include an optimal learning distance , a perception of neither being too far nor too near, and a sense of safety in that position. A smaller percentage mentioned that they had a personal preference for the middle rows for no specific reason.

The second most favoured choice is the last rows (13.9%). Reasons for this preference include the desire for freedom of

movement and the ability to stretch legs, finding the seating arrangement more comfortable , and a belief that sitting at the back allows for greater creativity and independence during the lecture. A few students also mentioned finding it interesting to observe the architecture of the lecture hall and some of them also answered they are not interested in theory classes while others mentioned it is less distracting to sit in the last rows.

Table 1 shows the role of instructor related factors in student seating plan/preference in the lecture halls.

The first rows rank third in preference (12.7%). Students opting for the first rows cited reasons such as perceiving them to be less distracting, the absence of competition for these rows, increased interaction with the presenter, and a desire to boost academic scores. Other factors include a fear of the lecturer, personal preference, and considerations related to hearing and vision problems.

Table 1: Students replies to questions on the factors pertaining to the instructor influencing their seating plan.

Question 1	**In what type of lecture do you prefer the first bench over the last?**
	Lecturer using chalk and board- 34.8%
	Lecturer using presentation and explaining more clearly- 26.6%
	Lecturer interacting with the students by discussion - 24.1%
	Lecturer using presentation and reading it like a news reader-11.4%
	Lecturer is just showing the first page of presentation without slideshow and interacting 3.1%
Question 2	**What kind of class do you think is more interesting for you?**
	Lecturer using presentation and explaining more clearly- 37.3%
	Lecturer using chalk and board- 29.7%
	Lecturer interacting with the students by discussion- 29.1%
	Lecturer just showing the first page of presentation without slide show and interacting -3.9%

47.5% of students said that they were introverted and independent. 24.7% of the students opined that they were outgoing and social type, 27.8% preferred not to fix their personality as a particular type.

44.3% students opined that their student's personality doesn't have a role in choosing a seat in the lecture hall whereas 36.1% students opined that an outgoing and social kind of an individual would prefer the last rows over the first rows. Similarly, 19.6% students opined that introverted and independent students would prefer last rows over the first rows.

Among the 158 students surveyed, the majority, 75.3%, reported trying to sit in a different seat than their preferred one. A smaller percentage, 15.2%, mentioned having done so rarely, while the remaining 9.5% stated that they have never changed their seat in class.

Among the 158 students surveyed, a significant majority, approximately 83.5%, emphasized the importance of individual

preference in choosing their seating position.

Out of the respondents, 67.7% identified as visual learners, 24.05% leaned towards auditory learning, and only 8.25% expressed a preference for kinaesthetic learning.

The detailed responses of students for the reason of avoiding front rows are tabulated in the Table 2 below.

Table 2. Showing the reasons for preferring last rows by medical students in lecture halls.

S.No	Reason	Strongly Agree	Agree	Disagree	Strongly Disagree
1	Fear of being called on/questioned by the teaching faculty	21.5%	58.2%	18.4%	1.9%
2	Need for being too much attentive all the time	23.4%	60.1%	15.2%	1.3%
3	Strong urge to use mobile phone during the lecture	4.4%	34.2%	44.9%	16.5%
4	To goof around with peers	3.8%	39.9%	46.8%	9.5%
5	To avoid authority figures in class/college noticing me	7%	44.9%	43.7%	4.4%
6	I usually prefer to sit at the same spot just because I am comfortable	19.6%	58.2%	20.3%	1.9%

Discussion

This study in an Indian medical college is the first of its kind, focusing on seating preferences and their impact on student learning experiences. Previous research indicates that seating arrangements play a crucial role in classroom dynamics. For instance, a study revealed that a semicircular seating arrangement outperformed rows-and-columns in terms of communication affordance, concentration maintenance, and overall classroom environment integration during Collaborative Learning (CL) activities [1]. Surprisingly in another study the outcomes of the multilevel modelling analysis revealed greater interaction intensity in rows compared to circles. However, the field of study and the facilitator engagement were considered relevant influencing factors for outcomes [2]. There are other studies which investigated on the preferences between traditional, horseshoe or modular arrangements in the class rooms and discussed about the factors like attractiveness of the course and student apprehension levels as important factors that could influence preferences [3].

The results of the present study emphasize important aspects such as fear and apprehension among students towards authority figures and instructors, highlighting the impact of a culture of paternalistic teaching methods on students' choices to some extent. Most students preferred to sit in the middle rows, aiming for what they perceived as a safe area that is optimal—neither too close to the instructor nor too far away. Students, in general, opposed the idea of assigned seating, indicating a more democratic desire for freedom of choice.

While many students believed that sitting in the rear rows might have some disadvantages, they thought that the subject and instructor were more significant factors affecting their learning than simply sitting in the last benches. Notably, most students identified as visual learners and expressed a

preference for a well-designed PowerPoint presentation with an interactive instructor for effective learning. However, they also expressed an appreciation for traditional chalk and board teaching methods and small group discussions.

In some studies, it has been put forward that culture plays a crucial role in students' seating preferences, particularly in achieving person-environment congruence through good aesthetics and facilitative learning approaches [4]. This raises a serious question for us to incorporate more democratic and adaptive learning methods in our teaching activities.

Students with similar personality characteristics tend to prefer central seats, and personality has been shown to play a role in seating preferences [5]. While we did not assess students' personalities scientifically, according to them, it is not the most important factor influencing their seating preferences

In a similar study, it was observed that sitting farther from the instructor had a detrimental effect on students' grades, resulting in a reduction of 0.75 percentage points per row [6]. However, such a belief and feeling do not exist in the participants of our study, but the likelihood of it needs to be investigated in pupils who habitually sit in the rear benches.

The utilization of a flipped classroom represents a viable and beneficial alternative to the conventional classroom approach. This methodology accommodates the preferences of Generation Y for active learning within a group dynamic, all the while retaining a traditional format for the initial presentation of information. This pedagogical approach has been recognized as both feasible and advantageous [7,8].

While gallery-style lecture halls are commonly favoured by both students and faculty, the conventional setup of accommodating 250 students in such a space presents challenges. The potential for student distraction and limited eye contact between the teacher and individual students diminish the effectiveness of traditional teaching methods in this setting. To address these concerns, there is a need for a redesigned space that incorporates strategic placement of screens throughout the classroom, ensuring better engagement.

In the realm of medical education, a spectrum of innovative teaching methods has emerged to enhance the learning experience for students. Embracing Problem-Based Learning (PBL), Simulation-Based Learning, and the Flipped Classroom approach encourages critical thinking, practical application of knowledge, and interactive participation of students. Team-Based Learning (TBL) fosters collaboration, while Interactive Lectures with Technology and E-Learning Modules harness digital tools for engaging and dynamic lessons. Incorporating Peer Teaching, Objective Structured Clinical Examinations (OSCEs), and Reflective Journaling further enriches the educational journey. Interprofessional Education (IPE) brings diverse healthcare disciplines together for comprehensive learning experiences. Notably, these strategies are very important in the current scheme of Competency-Based Medical Education (CBME) prescribed by NMC. As educators, staying updated on these methodologies is paramount, ensuring that our teaching practices evolve to meet the demands of contemporary medical education, ultimately equipping students with the skills essential for the dynamic healthcare landscape.

Conclusion

In conclusion, our study reveals that students favour backbenches primarily for the heightened comfort and ergonomic

advantages they offer during extended durations, alongside various other considerations. Conversely, the avoidance of front benches appears to be associated with a desire to distance oneself from authority figures in the classroom, among other reasons. Students also express a preference for traditional teaching methods and, to a certain extent, small group sessions. Notably, central rows emerge as the favoured seating area, seen as an optimal location to evade direct attention from the teacher while still staying within the zone of involvement.

This study stands as a pioneering effort in understanding the intricate factors that shape seating preferences among medical students in lecture halls. The insights gained offer valuable directions for future researchers, urging them to delve into various dimensions, including student and instructor variables, as well as aspects of aesthetics and design, all of which have potential implications on student seating preferences and, subsequently, their learning and performance outcomes. Ther is also a need to study the influence of cultural and socioeconomic backgrounds on seating preferences and how it impacts student learning. Lastly, a great deal of research is necessary to adapt and refine medical education methods for the Gen Z student!

Acknowledgements

We express our gratitude to all the participants who volunteered to be a part of this study, as well as to the faculty of the Forensic Medicine Department for their guidance in conducting this project. We extend special thanks to Dr. Narendra Bendi for his valuable and critical inputs.

Limitations

We have not delved into the design of the lecture hall or the types of seat arrangements. Aesthetics, ergonomics, and furniture aspects were not considered in our study. The words survey and questionnaire were used synonymously in the text. Similarly, we did not research about student seating preferences in small group discussions.

Conflicts of Interest

None to declare.

Ethical Considerations

Addressed by the authors.

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CASE REPORT

Death Due to Traumatic Amniotic Fluid Embolism Following a Fall From a Bed: A Case Report

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Abstract

Amniotic Fluid Embolism (AFE) is a rare obstetric emergency with a potentially fatal outcome, occurring in approximately 1.9 to 6.1 cases per 100,000 deliveries, with variations observed among different countries. Obstetric management continues to be the most common preceding event associated with AFE, making it the primary contributing factor. However, traumatic AFE cases are being typically reported as isolated case reports in literature. While previous case reports on the traumatic basis of AFE have primarily associated AFE with blunt-force abdominal trauma resulting from car accidents and evident gross injuries, this article presents a unique case of AFE following minor blunt trauma from a self-fall from a height of 2.5 ft, where no macroscopic lesions were observed. The autopsy lung histopathology exhibited alveolar spaces filled with serous fluid and lymphocytes, as well as emboli composed of fatty material in blood vessels. Some blood vessels contained keratinous emboli. Severe pulmonary oedema and embolized vessels were consistently observed throughout the lung sections. We hypothesise that a simple fall from a height of 2.5 feet onto a firm surface, leading to transmitted blunt force to the abdomen, may trigger AFE by disrupting the flow dynamics of the foeto-placento-maternal circulation. Despite the absence of gross injuries, the underlying pressure transmission is emphasized as a significant factor in AFE initiation due to the disruption of the microvasculature. This case report highlights the importance of recognizing the possibility of AFE even in cases of seemingly minor trauma without visible external signs.

Keywords: Amniotic Fluid Embolism, Disseminated Intravascular Coagulation, Respiratory Distress Syndrome, Obstetric Trauma, Anaphylactoid Syndrome

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Introduction

Amniotic Fluid Embolism (AFE) is a potentially fatal obstetric emergency characterized by sudden cardiorespiratory collapse and disseminated intravascular coagulation. The onset is abrupt, with sudden cardiorespiratory collapse, severe coagulopathy, and refractory to resuscitation. The incidence of amniotic fluid embolism (AFE) is estimated at approximately 1.9 to 6.1 cases per 100,000 deliveries. The exact prevalence is unknown due to incorrect diagnosis and failure to record nonfatal occurrences [1].

The onset of AFE requires two necessary conditions. Firstly, an influx of foetal components into the maternal circulation, and secondly, a significant pulmonary embolus or maternal immune/ anaphylactoid reaction against the amniotic fluid or foetal components [2].

The introduction of amniotic fluid into maternal circulation can transpire through multiple ways, including amniotomy (artificial rupture of foetal membranes for labour induction or augmentation), uterine or cervical tears during vaginal delivery, or caesarean section procedures. This influx can occur via several potential sites of entry: the endocervical veins, uterine trauma sites, or the placental attachment site. Subsequent proposed responses include either a reaction secondary to the obstruction of pulmonary blood flow or a proinflammatory reaction secondary to the release of cytokines derived from arachidonic acid from the amniotic fluid, resulting in an anaphylactoid reaction. In either case, the series of events result in pulmonary oedema and corresponding pulmonary hypertension leading to acute respiratory distress syndrome, hypotension, and hypoxia [3].

In obstetric practice, AFE is encountered usually during the process of labour and its management. However, forensic pathologists are concerned about the traumatic origins of amniotic fluid embolism. When an expectant mother dies as a result of obstetric trauma, it is critical for the pathologist to determine how the trauma occurred. This finding is extremely important in legal processes because such accidents result in the death of both the mother and the foetus. It is also critical to emphasise that even seemingly slight injuries during pregnancy pose major harm to the developing foetus's well-being. In this article, we present a case of a seemingly insignificant trauma that led to a fatal amniotic fluid embolism to the mother and both the mother, and the foetus succumbed to the events following the trauma.

Case report

A 21-year-old female, gravida 2, para 1, at 8 months of gestation, was found unconscious in a left lateral position on a marble floor late one night, adjacent to her usual sleeping place on the bed (the height of the bed is 2.5 ft. from the ground). Despite immediate transportation to the hospital, she was declared dead upon arrival. Given the absence of antecedent symptoms or known risk factors for adverse pregnancy outcomes, an autopsy was conducted to determine the cause of her sudden demise. Throughout her antenatal care, all clinical and laboratory parameters remained within normal ranges. The police registered the case as a suspicious death, with the presumed cause being "death due to accidental fall from a bed." The postmortem examination was conducted by a team of doctors with expertise in forensic pathology, obstetrics, and surgical pathology.

On external examination, the corpse showed generalized cyanotic features. Two contusions measuring 3 x 3 cm each were present over the posterior aspect of the left shoulder joint and the posterolateral aspect of the upper part of the left arm. Internally, the autopsy revealed no outer surface abnormalities in the uterus. On further dissection, placental attachments were normal, and liquor was adequate and clear. There were no signs of haemorrhage or injury in the entire uterine cavity. A 08-month-old male foetus was found inside the uterus, measuring 40 cm in length, and weighing 2.6 kg, showing no injuries. All major visceral organs were congested and did not yield any positive contributory finding toward the cause of death. Apart from the routine viscera for chemical analysis (liver, kidneys, blood, and stomach & intestine along with contents), swabs from the vagina, cervix, and anus were collected to rule out any presence of a foreign body or chemical poisons. However, both of the investigations turned negative.

Histopathological examination (HPE) of lung sections displayed alveolar spaces filled with serous fluid and lymphocytes within the septa. The blood vessels exhibited red blood cells and emboli, identified as globules of fatty material. The interstitium showed evidence of serous fluid. The grossly grey-white appearing areas of the lung cut section revealed lymphoid aggregates, fibro-collagenous bundles, nerve bundles, and dilated, congested blood vessels in microscopy. Notably, some blood vessels contained granular eosinophilic emboli (keratinous). Severe pulmonary oedema and embolized vessels were evident in all the lung sections studied. Other organ histopathology yielded normal findings, except for the expected pregnancy-related changes in the uterus. More particularly, the placental histology was also normal.

Based on the positive lung histopathological findings (Figures 1-3), postmortem findings, and other negative ancillary investigation results, traumatic amniotic fluid embolism was considered the most probable cause of death. Immunohistochemistry was not attempted in this case due to logistic constraints.

This unusual case highlights the significance of considering traumatic amniotic fluid embolism (AFE) in the setting of falls during pregnancy, as it could lead to maternal mortality. To the best of our knowledge, this is the first reported instance of AFE resulting from a fall from a bed onto a hard surface.

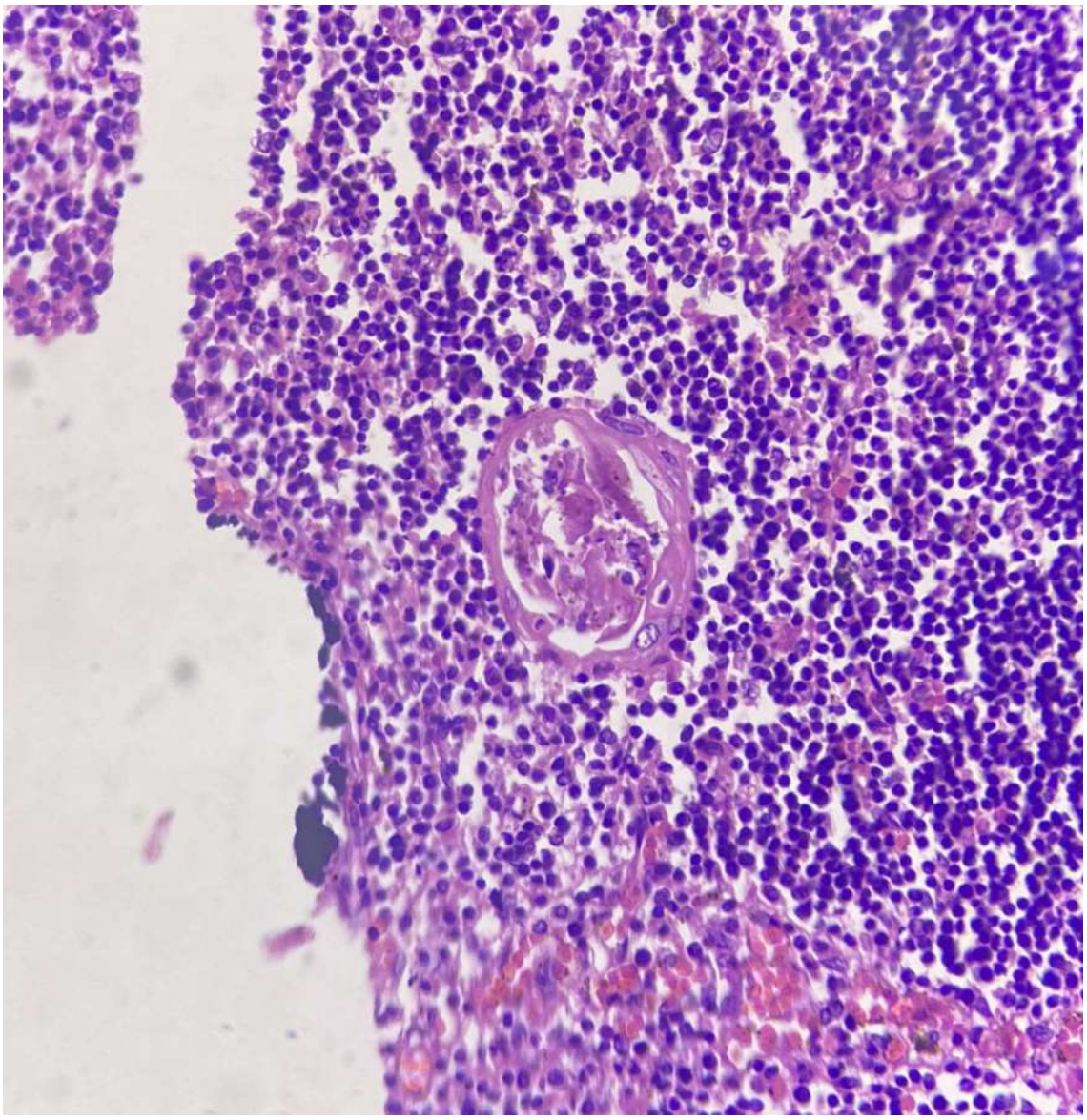

Figure 1. Photomicrograph of HPE Lung: Abundant lymphoid aggregates & blood vessel with granular eosinophilic emboli (keratinous), 40X Haematoxylin and Eosin.

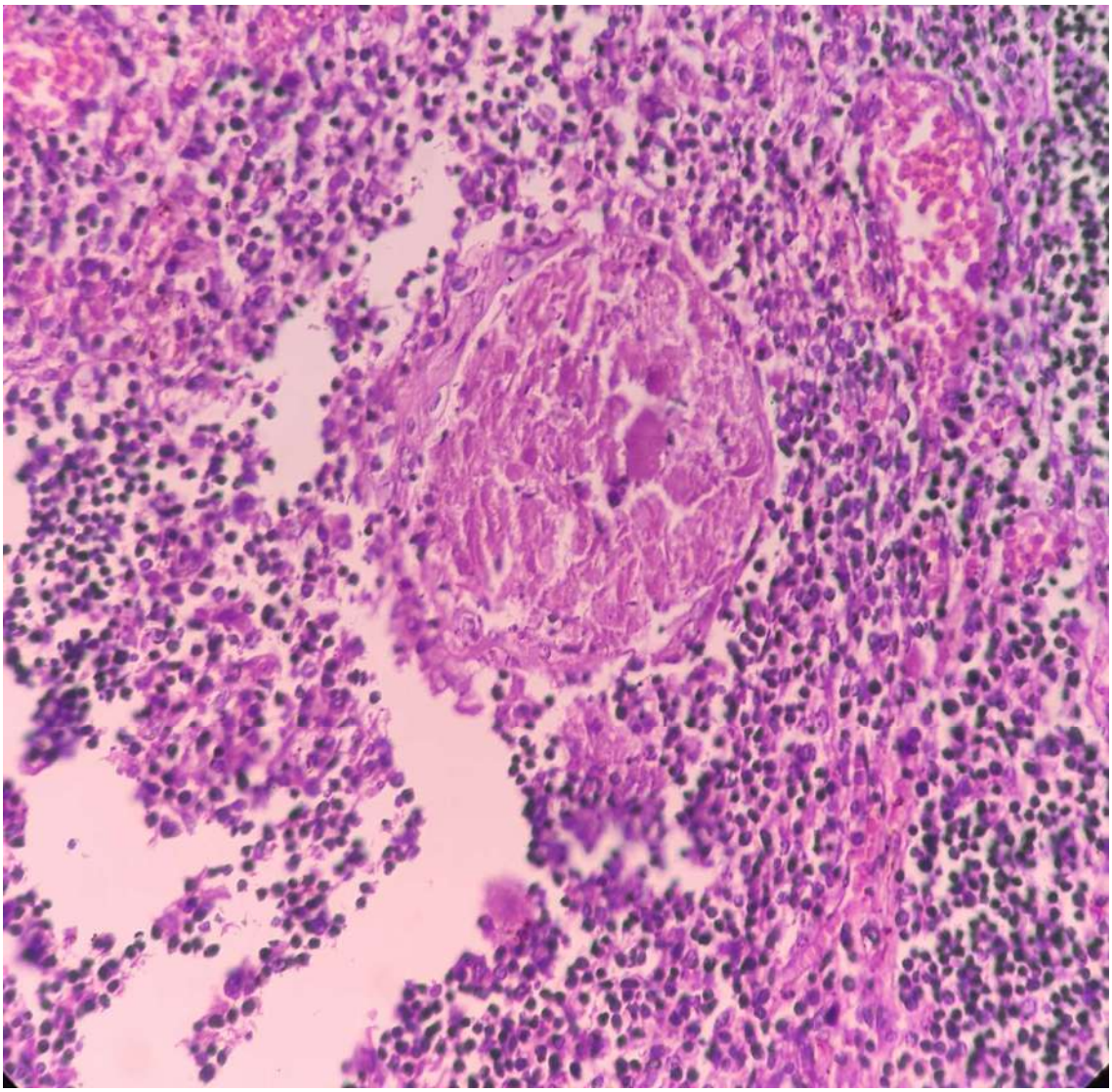

Figure 2. Photomicrograph of Lung HPE: Abundant lymphoid aggregates & blood vessel showing granular eosinophilic emboli (keratinous), 40X Haematoxylin and Eosin.

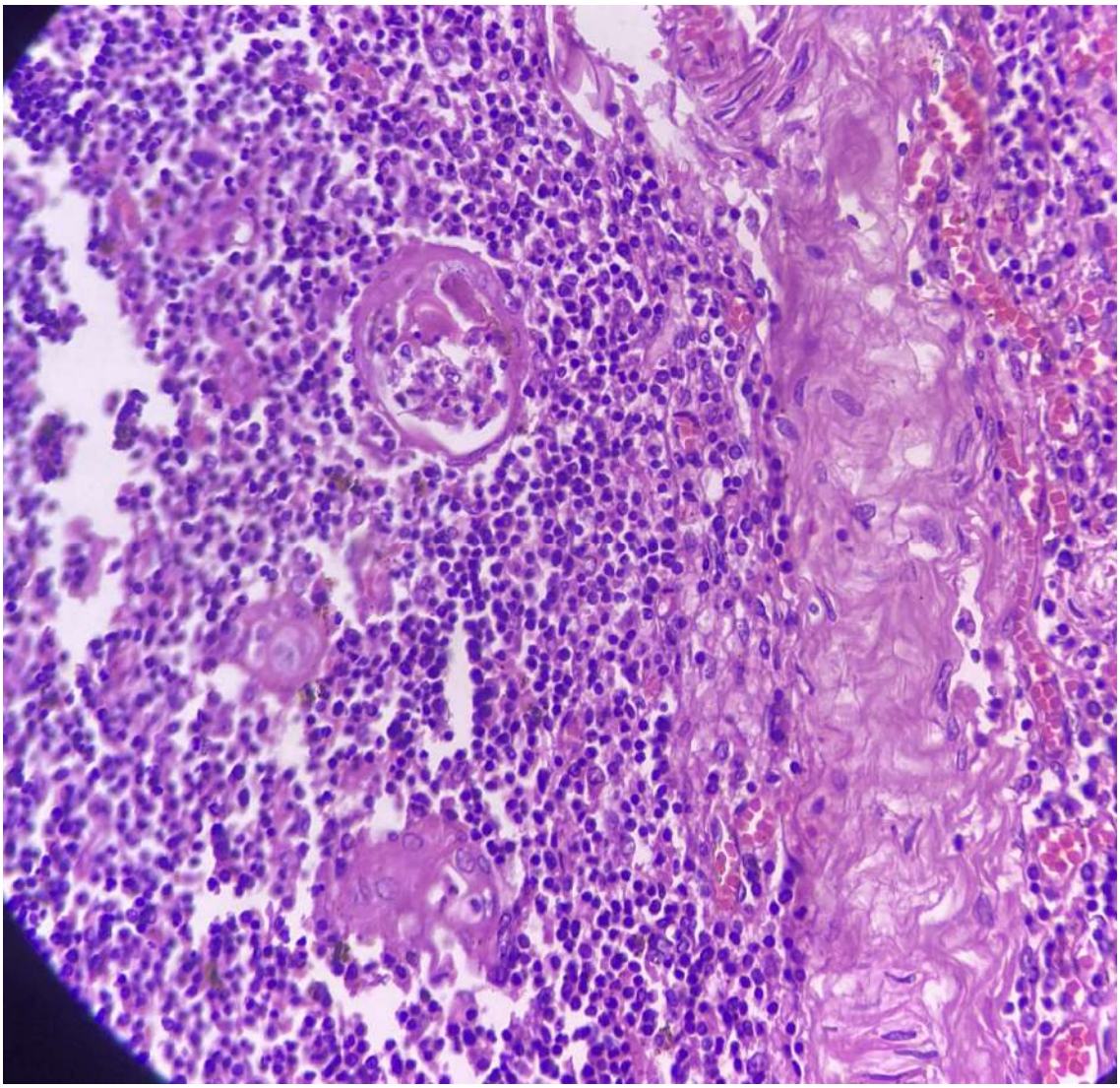

Figure 3. Photomicrograph of Lung HPE: Abundant lymphoid aggregates & blood vessel showing granular eosinophilic emboli (keratinous), 40X Haematoxylin and Eosin.

Discussion

Blunt-force abdominal trauma during pregnancy can pose a significant risk for AFE, as it may cause direct injury to the uterus, leading to the entry of amniotic fluid into the maternal circulation and the subsequent pathophysiological responses described above. Trauma-induced AFE occurs when there are tears in the uterus or cervix due to various scenarios, such as road accidents, falls from beds, or direct blows to the abdomen.

The main question we need to address for clarity and understanding in our case is whether Amniotic Fluid Embolism (AFE) can be caused by blunt force trauma, even when there are no obvious tears or visible damage in the maternal tissues. It is plausible to consider that blunt force trauma could lead to changes in the flow dynamics of the foeto-placento-maternal circulation, potentially originating from the large placental surface, even if there are no

apparent macroscopic lesions or visible signs of damage.

In this scenario, it is hypothesized that the impact of blunt force may damage delicate microvascular structures, leading to subtle microscopic alterations not immediately observable. This trauma-induced disruption may affect the placental or uterine microvasculature, causing the release of amniotic fluid components into the maternal bloodstream. The formation of small emboli from these micro-scale disruptions can obstruct pulmonary vessels, resulting in a rapid increase in pulmonary vascular resistance, or can cause pulmonary vasospasm apart from initiating the cytokine storm.

In our specific case, the second crucial question to be answered is whether there was a de novo or spontaneous occurrence of Amniotic Fluid Embolism (AFE) that led to the agony and fall, or if the trauma was the initial event. Precisely put, we need to determine whether AFE occurred independently, without any external trigger, or if the trauma occurred first and potentially contributed to the development of AFE. It is important to note that existing literature tends to heavily lean against the possibility of spontaneous AFE, indicating that there is usually an identifiable event or trigger that precedes its occurrence.

In this context, pregnancy-related and pathology-related anaphylactoid syndromes of pregnancy are not relevant to our discussion. However, a summary of the clinical picture, clinical parameters for evaluation, autopsy related gross and histological findings in cases of AFE are summarised in Table 1.

Table 1: A Summary of Amniotic Fluid Embolism/Anaphylactoid Syndrome of Pregnancy [4-13]

1	Clinical features/ Risk factors	Hypoxia, Hypotension, Seizures, Disseminated Intravascular Coagulation (DIC), Altered mental status, Shortness of breath Cardiac arrest, Shock, Death Risk factors: Age > 35years, African/ other American, Polyhydramnios, Blunt abdominal trauma and surgical trauma, Procedures like pregnancy termination, amniocentesis, Pre-eclampsia/ eclampsia, Induction of labour, Placenta previa/ abruption, Foetal distress, Instrumental delivery, Vaginal breech delivery, Caesarean delivery Cervical laceration/ uterine rupture, Manual removal of placenta, Multifetal pregnancy, Gestational age < 37weeks Postdated pregnancy, Foetal macrosomia.
2	Pathogenesis	A breach in physical barriers between maternal and foetal compartments at the endocervical veins, uterine trauma sites, and placental attachment site is one of the primary prerequisites. Foetal components in amniotic fluid cause pulmonary vasospasm due to anaphylactoid reaction. It is an immune inflammatory reaction called an anaphylactoid syndrome during pregnancy

		AFE: necessitates two components: 1. Foetal components in maternal circulation. 2. Significant pulmonary embolus or maternal immune/ anaphylactoid reaction. • In the cardiovascular type of AFE: Physical obstruction in maternal micro vessels of various organs results in shock and loss of consciousness. • DIC type of AFE: Clinical AFE with secondary Post Partum Haemorrhage (PPH) of unknown aetiology. • Amniotic fluid into uterine vessels: Anaphylactoid reaction leading to the oedematous uterus. • In uterine type AFE: Histamine, bradykinin, inflammatory cytokines such as IL 8 and procoagulant substances lead to endothelial activation and an eventual massive inflammatory reaction. The severity of an anaphylactoid reaction depends on the balance between the inflow amount and quality of the amniotic fluid and the potential of biological inhibitors.
3	Laboratory Parameters/ Investigations	Increased levels of fibrin products, Decreased levels of fibrinogen, Increased levels of PT and PTT, Thrombocytopenia, Echocardiography ECG CXR CBC, LFT, RFT, Coagulation profile, Serum electrolytes, arterial pH, ABG, Glucose, cardiac enzymes(Sialyl-Tn <46IU/ml), ZnCP1 <1.6pmol/L- detection indicates AFE, Complement 3 (80-140mg/dl) - decreased Complement 4 (11-34mg/dl) – decreased IL 8 (<20pg/ml) – increased C1 esterase inhibitor – decreased
4	Treatment / Monitoring	Massive transfusion protocols (fresh frozen plasma preferred over RBCs), Hemofiltration, and plasma exchange transfusions, High dose corticosteroids, C1 inhibitor concentrate, Volume replacement by crystalloids/ colloids. (500ml of fresh blood increases fibrinogen by 12.5mg per 100ml and it also adds 10000 to 15000 platelets per cu mm. 1-unit FFP raises fibrinogen by 5-10mg/dl, 1 unit cryoprecipitate raises fibrinogen by 5-10mg/dl, 1 unit platelet concentrate raises the platelet count by 7500/ml, 1-unit Packed RBC raises HB by 1g/dl, which increases oxygen carrying capacity)

		In acute conditions: IV heparin 5000 units at 4-6 hours intervals, Fibrinolytic inhibitors: EACA: inhibits plasminogen and plasmin. Aprotinin (Trasylol) Cardiotocography Pulse oximetry
5	Postmortem Appearances:	The postmortem examination reveals several findings related to Amniotic Fluid Embolism (AFE) in the lung, including pulmonary oedema, congestion, and focal atelectasis. Additionally, in cases of Uterine type AFE, features of acute myometritis are observed. Diagnosing AFE primarily relies on histological analysis. To confirm the diagnosis, an examination of pulmonary artery blood is necessary. Furthermore, investigation for genital tract trauma, such as tears or ruptures in the cervix, vagina, uterus, or adjacent soft tissues, should be conducted. In cases where no apparent abnormalities are observed during the evisceration process, a comprehensive examination of the entire group of organs is crucial. Histopathological findings in the right ventricular myocardium may indicate an acute increase in pressure in the pulmonary circulation, further supporting the diagnosis of AFE.
6	Histopathology / Immunohistochemistry	Foetal components: Routine H&E staining (epithelial squamous cells, lanugo hair, fat) Alcian blue: mucin, Attwood's stain – stains the keratin red and mucus turquoise blue. Lendrum Stain: Contains phloxine tartrazine detects squames by staining them red. Sudan black or oil red – vernix caseosa. IHC: Cytokeratin AE1/AE3: foetal squamous cells, ZnCp-1 stain for meconium C5a receptor(CD88) stain: complement activation and anaphylactoid formation in various organs Amniotic components in pulmonary vessels: Alcian blue and ZnCp-1 stain AE1/AE3 staining of the lung: Intravascular positivity of foetal squamous cells. Immune histochemical staining for CD 88: positive in stromal cells around pulmonary capillaries and inflammatory cells in the alveolus. In Myometrium of DIC type PPH: tryptase halos around activated mast cells, elastase positive neutrophils, CD 68 positive macrophages.

In the context of Amniotic Fluid Embolism (AFE) and its association with trauma, it is worth noting that although trauma, especially from road traffic accidents, is acknowledged as an important cause of AFE in Western countries, there are relatively few reported cases in the medical literature. Specifically, there has been limited case reports that link trauma to AFE. Some of these reports involved car accident cases where both chorionic villi embolism and AFE were observed. Additionally, there have been instances of the successful revival of pregnant women from AFE, as reported by researchers. However, a significant difference between several of these reported cases in the literature and the present case is the absence of noticeable gross features of an injury identified as the site of breach responsible for triggering AFE [14-19].

Conclusion

In conclusion, our hypothesis suggests that a simple fall from a height of 2.5 feet onto a hard surface, resulting in blunt force transmitted to the abdomen, has the potential to cause Amniotic Fluid Embolism (AFE) without any gross lesions. Our reasoning is based on the notion that such trauma could lead to alterations in the flow dynamics of the foeto-placento-maternal circulation, potentially affecting the microvasculature. Although there were no visible macroscopic injuries, the underlying changes in microvascular structure could play a significant role in triggering AFE in these cases.

Conflicts of Interest: None to declare.

Funding: Nil.

Ethical Considerations: Addressed by the authors.

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CASE SERIES

"K-SIGN" in Retrocaecal Appendicitis – A Case Series

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Abstract

Background: When someone has appendicitis, the symptoms can be different depending on where the appendix is located. When someone has retrocaecal appendicitis, their symptoms are different from those of classical appendicitis in which the appendix is in the usual place. K-Sign show that the back wall of the abdomen is soft in people with paracolic appendicitis. As a sign of respect, the K-Sign is called the "Kashmir Sign" after the place where it forms, Kashmir. When the inflamed appendix crosses above the iliac crest on the back wall of the abdomen, it's a sign. The soreness is caused by irritation of the peritoneum on the back wall of the abdomen. **Case Presentation:** A group of five patients were studied and a K-Sign was used to find tenderness on the back wall of the abdomen. The tenderness was found in a specific area bounded by the 12th rib above, the spine below, the side edge of the back wall below, and the iliac crest above. All 5 of the cases had pain in this place on the back wall of the abdomen. They all wanted to have an appendectomy and had a report from a histopathological test that showed their appendix was inflamed. **Conclusion:** The K-Sign was looked at in a swollen appendix that was retrocephalic and paracolic. The K-Sign is important because it's hard to diagnose retrocaecal appendicitis and it can lead to other problems.

Key words: K-Sign, appendicitis, appendix

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Background

The retrocaecal appendix shows up in 70–80% of different appendix positions, and retrocaecal appendicitis can show up in some unusual ways with certain symptoms [1,2]. There may not be enough inflammation to cause pain in the right iliac fossa, but this is a rare sign of retrocaecal appendicitis in its early stages. Soreness is caused by inflammation of the appendix's serosa and the parietal peritoneum that lies on top of it. However, because of its location, retrocaecal appendicitis doesn't always cause soreness in the lower right abdomen, which can make diagnosis harder. One of the problems with diagnosing appendicitis is that it gets easier as you learn more about the symptoms of acute appendicitis [3,4]. It's important to know that the vermiform appendix can be in different places.

This is because when someone has appendicitis, the different positions of the appendix can cause different symptoms and signs that look like those of other diseases like diverticulitis and ovarian torsion [5].

Methods of eliciting K-sign

K-sign was checked while lying on the left side and supine. The posterior abdominal wall was percussion-palpated in an area bounded by the spine, the 12th rib, the iliac crest, and the lateral edge of the posterior abdominal wall. Starting at the side edge of the back wall of the abdomen, percussion is applied from the 12th rib to the iliac crest, moving from above to below. The whole area is then felt to see if there is any soreness; this is done starting from the 12th rib each time. You can also check for the K-sign by pressing on the area from the side of the back wall of the abdomen all the way to the spine, going from the side wall to the spine and back again, starting from the side wall and writing down the exact spot where it hurts.

Case Presentations

Case Report 1

A 10-year-old boy came to Palanpur Civil Hospital, surgery on call, with pain in his lower right belly and a fever that had been going on for 12 hours. He had been sick and had a fever in the past. According to the abdominal finding, the right iliac fossa is painful to touch deeply. The K-sign was positive, and there was soreness between the middle of the psoas muscle and an area next to it that ran laterally to the psoas muscle and went up from the iliac crest. The psoas sign was also good. An abdominal sonogram showed a structure that could not be compressed in the right iliac fossa, which is a sign of a swollen appendix tip. The patient had an appendectomy, and the 8 cm long, swollen appendix was placed behind the urethra. The appendix was full of pus and faeces. The time after surgery and the follow-up were routine.

Figure 1. Retrocaecal appdendix in ultrasonography scan

Case Report 2

A 23-year-old man came in with mild pain in his right side, fever, vomiting, and loss of appetite that had been going on for two days. At the general checkup, everything looked fine, but there was a fever. On the abdomen exam, there was rebound soreness and Rovsing's sign. The psoas sign was bad. The K-sign was positive in an area that went from the side of the psoas muscle to the side that went from the iliac crest. The abdominal sonography came back normal. The patient had surgery to remove an appendix, and during the procedure, doctors found a swollen, 10.6-centimeter-long paracoiling appendix with faeces inside. Histopathology showed that it was appendicitis. There was no follow-up.

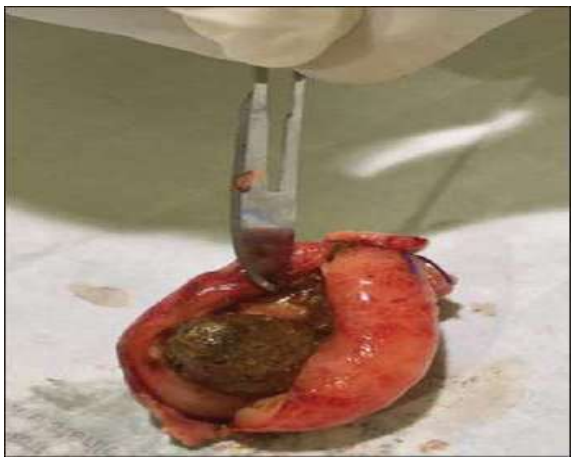

Figure 2. Fecolith in specimen of appendix

Case Report 3

A girl who was 11 years old came in with stomach pain and puking that had been going on for 12 hours. She was admitted to be watched, and after six hours, the pain moved to the right iliac area and she got a fever. She had a fast heart rate and low blood pressure. An inspection of the abdomen showed that the right iliac fossa was not painful. The psoas sign was good. It was discovered that the K-sign was positive once a week in a small

area on the psoas muscle and the neighbouring posterior abdominal wall, extending above the iliac crest. Sonography of the abdomen shows a structure that can't be compressed, which is a sign of a subacute appendix. The patient had surgery to remove an appendix, and a 6 cm retrocaecal appendix with several faeces inside was seen. The patient was sent home on the fifth day after surgery and had a smooth follow-up.

Case Report 4

A 30-year-old man came in with pain in his right upper belly, vomiting, and a fever that had been going on for two days. The person looked dehydrated and had a fever, low blood pressure, and a fast heart rate. The blood test results point to leucocytosis. On evaluation of the abdomen, there was tenderness in the upper and middle right quadrants. The right iliac fossa did not hurt. The psoas sign was good. The K-sign was positive from the iliac crest to the 12th rib along the side of the psoas muscle. An X-ray of the abdomen shows a small ileus in the upper right part of the abdomen. An ultrasound of the abdomen showed that the patient had acute appendicitis and a buildup of free fluid around the appendix. The patient had surgery to remove an appendix, and during the procedure, a retorcaecal, subhepatic, 15.4 cm long appendix with pus surrounding it was found. The histopathology report suggests that the patient had appendicitis, and both the surgery and the follow-up time went smoothly.

Case Report 5

A 10-year-old girl came in with pain in her stomach and puking that had been going on for two hours. She was admitted to be watched, and after six hours, the pain moved to the right iliac area and she got a fever. An check of the abdomen shows that the right iliac fossa is not painful. The psoas sign was good. The K-sign was positive in a small area on the psoas muscle and the back wall of the abdomen next to it, with the iliac crest extending above it. On the belly X-ray, there was a localised ileus in the lower right corner. An ultrasound of the abdomen showed a structure that could not be compressed, which is a sign of a swollen appendix. The patient had an appendectomy, and a 7-cm retrocaecal appendix with several faeces inside was seen. The patient was sent home on the fifth day after surgery and had a smooth follow-up.

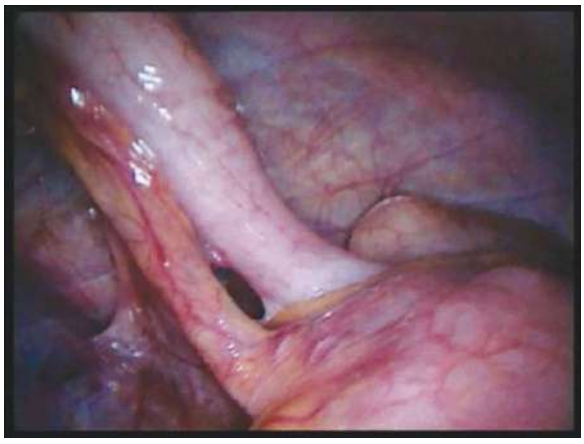

Figure 3. Inflammed appendix

Discussion

It is hard to tell what kind of appendicitis someone has in the retrocaecal area, and it may spread more slowly than in other places on the body. Retrocaecal appendicitis can be reliably diagnosed by taking a patient's medical history, doing a physical check, and then running lab tests. The same as all the other places in the appendix. There is a high chance that this retrocaecal appendicitis will cause changes in the retroperitoneum that are inflammatory and involve fat stranding that can reach the fasciae and fatty tissue in the retroperitoneum. It is possible to feel pain over the appendix in all kinds of appendicitis, but it is hard to feel pain in the right iliac region when you have retrocaecal appendicitis. This happens because the swollen caecum blocks the pressure from the palpating hand reaching the inflamed appendix, which is why deep pressure in the lower right quadrant may not produce pain. This is known as "silent appendicitis." People who have retrocaecal appendicitis may feel some mild pain on the right side or in the shoulder. A long, swollen appendix in the retro-colic area can make it hard to tell the difference between cholecystitis (sub hepatic) and ovarian torsion. When someone has retrocaecal or paracolic appendicitis, the peritoneum on the back of the abdomen may become inflamed, which will show a positive psoas sign.

McBurney's point is located on the right lateral line, just 1-2 cm below where the right lateral plane and transtubercular plane meet. The iliac bone and its attachments make it impossible to feel pain at McBurney's point from the back. The normal length of an appendix is between 2 and 20 cm, with 9 cm being the average length. In the retrocaecal and paracolic types, it will be raised above the illac crest. In this case, tenderness will be felt where the inflamed appendix touches the posterior parietal peritoneum, which is also the location of the corresponding area of the posterior abdominal wall. The painful area will rely on the appendix's length, thickness, intrinsic position in relation to the cecum, the part of the appendix that is inflamed, its direction, the presence of fibrosis, pus, fecolith, any kinks or adhesions, and the position of the mesentery adhesion. This sign happens because an inflamed appendix rubs against the covering posterior parietal peritoneum, similar to the psoas sign. This sign can also be used to show that you have appendicitis in the right iliac fossa. In all of our cases, the appendix was long enough to cross over the iliac crest, and it was in a good place, posterior to the ileum and away from the spine. It has also been said that the meaning of a sign in an appendix is never complete without looking at the small organ's topography. The situation of an appendix that is severely inflamed can almost always be identified by the pressure method, which supports this sign [6].

The importance of the k sign in the retrocaecal and paracolic types of appendix will help with early diagnosis because these types of appendix are more likely to have gangrenous complications because their blood supply is more likely to become kinked and inflamed when the cecum is fixed [7]. One problem with the K-sign is that it can't be used to check on fat or morbid patients or people who are physically limited by spine problems. The retrocaecal appendix is covered in retroperitoneal fat, making it hard to feel. People with a very small retrocaecal or paracolic appendix may also have trouble

feeling it. K-sign can be positive in other problems in the retroperitoneum, such as renal colic, cholecystitis, ureteric colic, psoas abscess, intramuscular hematoma, and more.

Conclusion

K-sign is a very helpful sign for diagnosing retrocaecal or paracolic appendicitis. It is also very useful for telling the difference between appendicitis and other conditions that affect the retroperitoneum, such as renal colic, cholecystitis, ureteric colic, psoas abscess, intramuscular hematoma, and more.

Conflicts of Interest: None to declare.

Funding: Nil.

Ethical Considerations: Addressed by the authors.

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SHORT COMMUNICATION

Inclusion of Occupational Health in MBBS Course Curriculum in India

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Abstract

Occupational diseases contribute significantly to the global burden of diseases.Doctors employed in industrial hospital should have a basic knowledge of occupational health for efficient management of work related diseases.In different countries of world teaching sessions on topics of occupational health are conducted for undergraduate medical students.As more and more industrialization is going to take place in India ,it is felt that basic knowledge of occupational health should be acquired by the undergraduate medical students of India during MBBS to produce competent doctors who can efficiently deal with occupational diseases.

Keywords: Occupational, Health, MBBS

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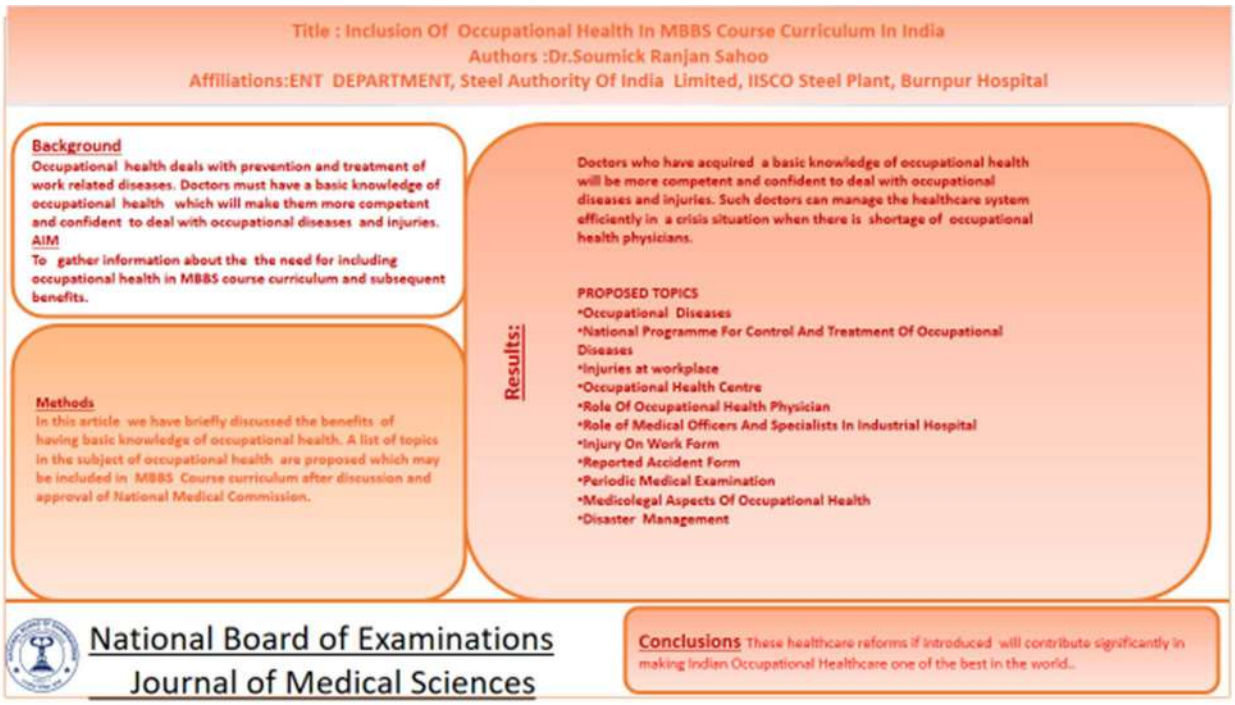
Graphical Abstract



Introduction

Industry plays an important role in the economic prosperity of the country.Besides contributing to the economy it also provides employment to people of the country.The workers working in such industry /factory visit various hospitals for treatment.In India workers either visit the industrial hospital attached to the industry or visit E.S.I/E.S.I.C/E.S.I.S hospitals or general government or private hospitals

In an industrial hospital for any ailment, the patients usually visit the occupational health centre of the industry, emergency or the speciality department of the main hospital. It is very important for the specialists or medical officers employed in the hospital to have sound knowledge of the diseases in industrial patients.

Burden of Occupational Diseases

Occupational injuries contribute significantly to the global burden of diseases.According to International Labour Organization estimates , work related injuries and illnesses lead to approximately 2 million deaths worldwide [1,2].

It also leads to huge financial losses.Various costs covered include medical costs,wage loss,household production loss and loss due to pain and suffering. The total financial loss may be estimated to be approximately US$ 77 billion [3].

Definition of Occupational Health

Occupational Health may be defined as highest degree of physical ,mental and social well being of workers in various occupations.It focuses on safety and health aspects at the workplace [4].

Need for Occupational Health Training in Medical Schools

Inadequate medical training leads to non recognition and mismanagement of occupational diseases [5] It is important for physicians and paramedical specialists to keep themselves updated regarding the relationship between work and the diseases in order to properly diagnose, combat and prevent work related diseases [6]. A basic level of training if acquired in medical colleges would help in producing a competent doctor who can provide primary care to industrial workers.

Occupational Health Teaching in Medical Schools in the World

A study in United States showed that 68% of the responding schools specifically taught occupational health during the 1991/92 academic year as compared to 50% in the 1977/78 and 66% in the 1982/83 academic years [7]. The median curriculum time required was 6 hours in 1991/92, compared to 4 hours in both previous surveys [8,9].

In Australia and New Zealand, the number of hours devoted to occupational and environmental medicine topics varied widely. [10]

In England, Harrington et al. [11] observed that the number of schools delivering formal instruction in occupational medicine had increased from 60% in 1974 to 92% in 1989.

Legislation Relating to Occupational Health in India

The Factories Act (1948) and the Mines Act (1952) contain the main provisions for legal measures for the protection of health and safety of workers. In India,Occupational Health is covered under 1.MinistryOf Labour And Employment and 2.Ministry of Health and Family Welfare [4].

National Programme for Control and Treatment of Occupational Diseases

The Ministry of Health and Family Welfare, Government of India, launched a programme entitled “National Programme for Control and Treatment of Occupational Diseases” in 1998–99. The categories of major occupational diseases in India are: [12] occupational injuries, occupational lung diseases, occupational cancers, occupational dermatoses, occupational Infections, occupational toxicology and occupational mental disorders.

Based on etiology major groups of occupational disorders in India include occupational injuries: ergonomics related; chemical occupational factors: dust, gases, acid, alkali, metals etc.; physical occupational factors: noise, heat, radiation etc.; biological occupational factors; behavioural occupational factors; and social occupational factors.

As per The Indian Factories Act 1948 3rd Schedule [13]. Sections 89 and 90 – list of notifiable diseases, there are 29 enlisted diseases. They include poisoning by metals and compounds such as lead, tetra-ethyl lead, phosphorous, mercury, manganese, arsenic, nitrous fumes, carbon bisulphide, benzene, their nitro or amido derivatives or its sequelae, chrome ulceration, anthracosis, silicosis, radium or other radioactive substances, halogens or

halogen derivatives, cancer of the skin, toxic anaemia, jaundice, oil acne or dermatitis due to mineral oils, byssionosis, asbestosis, contact dermatitis, noise-induced hearing loss, beryllium, carbon monoxide, coal miners' pnoumoconiosis, phosgene, isocyanates, occupational cancer and toxic nephritis.

Occupational Health Training in India

The courses offered in occupational health in India include Associate Fellow in Industrial Health, diploma course in Industrial Health, and Master's program in Environmental and Occupational Health [14].

Proposals

However it is felt that certain basic topics of occupational health may be included in the undergraduate MBBS medical course curriculum along with workplace exposure wherever feasible. One of the main reasons for ineffective implementation of occupational health in India is lack of trained occupational health manpower with deficient institutions, qualification courses, training modules, infrastructure, facilities and budgetary provisions make the implementation of legislation a challenge [4]. A doctor who had a basic idea of occupational health during his undergraduate career will be in a better position to deal with healthcare issues in an industrial hospital including disaster management if he/she employed in an industrial setup. In case of a disaster happening, occupational health professionals must ensure their own safety, grasp the occupational health needs changing over time, and make decisions on the basis of changing situations [15]. Also during a crisis when there is shortage of occupational health physicians in an industrial hospital,the doctors having a basic idea of occupational health can manage the healthcare system efficiently.

A list of topics are proposed which may be included in the syllabus of the undergraduate medical course curriculum after discussion with the Under-Graduate Medical Education Board of the National Medical Commission

- Occupational Diseases
- National Programme For Control And Treatment Of Occupational Diseases
- Injuries at workplace
- Occupational Health Centre
- Role Of Occupational Health Physician
- Role of Medical Officers and Specialists In Industrial Hospital
- Injury On Work Form
- Reported Accident Form
- Periodic Medical Examination
- Medicolegal Aspects Of Occupational Health
- Disaster Management

At the undergraduate level ICMR STS Research projects may be carried out on topics such as occupational noise induced hearing loss,occupational asthma, occupational eye injuries, Hearing Conservation Programme etc.

Selected PSU hospital which have been accredited by NBEMS for DNB training

may be upgraded as centre of excellence for research on occupational diseases.

Expert opinion may be taken from medical schools of world who have included basics of occupational health in undergraduate course curriculum, WHO Health Officials, Members of International Labour Organization, experts from Indian Association Of Occupational Health, Ministry Of Health And Family Welfare, Ministry Of Labour And Employment, NITI AAYOG etc

Conclusion

A basic knowledge of occupational health in MBBS course curriculum will help medical students to efficiently tackle workplace related diseases which they may encounter after becoming qualified doctors.

Also research carried out under ICMR will contribute to the medical literature on occupational diseases.

These healthcare reforms if introduced will contribute significantly in making Indian Occupational Healthcare one of the best in the world.

Conflicts of interest

The authors declares that they do not have conflict of interest.

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