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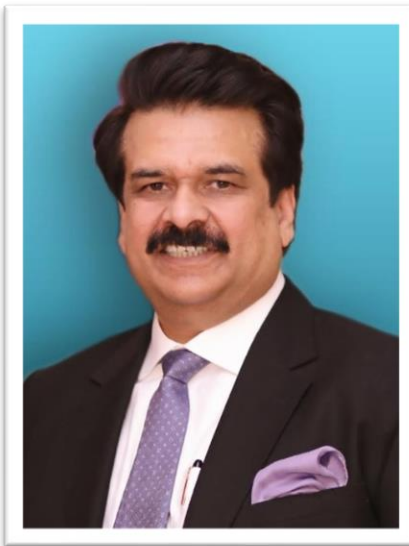
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Message From Chief Editor



Dr. M. Riaz Shahbaz Janjua

Chairman: HBS M&DC

Allah TWT says in Quran that “Saulayheen” shall have command on Earth. Most of the scholars have translated “Sualayheen” incorrectly. Actual meaning of “Sualaheen” according to the Arabic lughat (Dictionary) is a people who are competent and proficient or who possess the capability. We, as health professionals, are gifted of being “Saulayheen” as are capable of gaining scientific knowledge by carrying out research.

I believe that it is on the shoulders of today’s practicing doctors and teachers, to learn the essential skills necessary to be able to carry out research in an effective clear, methodical and time effective manner. Effective literature review, filling the gap in existing research with new information gained by one’s own research endeavors and its documentation is mandatory to conduct a result-oriented-research.

Launching of the Journal of HBSM & DC is a step towards fostering research and providing a new platform to publish good quality research papers based on empirical or scholarly research work encompassing the fields of Medicine and Dentistry. Editorial board of JHBSMDC is comprised of our faculty members well known in their specialties nationally and internationally. Each member is committed to work with utmost dedication in order to bring this journal at par with internationally renowned impact factor journals.

I pray and hope that this journal will benefit people in the field of Medicine and Dentistry and shall unravel a chain of research questions with innovative ideas compelling the researcher to think out of the box.

I am very thankful to all the members of editorial board for their hard work in stream lining the matters of publication. I am also grateful to our national and international reviewers for giving their consent to be a part of this noble cause. I can never ignore the role of authors who contributed to the journal.

Above all I can never thank Allah TWT enough for His Fazal and Rehmatulil Alameen, Sarwar e Kainat Hazrat Mohammad S.A.W. (may peace be upon him) for his Rehmat as it is my faith that crossing this milestone could not have been possible without these blessings.

May Allah TWT make everyone contributing to this journal most capable and may He bless you all with the best of capabilities.

Thank You



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Change in Thickness of Adult Male Human Calcified Articular Cartilage Zone with Aging

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Abstract

Objective: To measure change in the thickness of calcified cartilage zone of male human articular cartilage (AC).

Methodology: Forty articular cartilage samples. were collected from the right knees of male cadavers aged between 21 to 60 years. The samples were placed in four groups. Tissue processing and cutting were followed by H&E staining. And calcified cartilage zone thickness was measured.

Results: With advancing age there was increase in thickness of articular cartilage at knee joint.

Conclusions: With advancing age, the calcified articular cartilage zone thickness increases leading to osteoarthritis. Delaying or preventing of this change with aging makes this zone an important target for preventive and therapeutic measures.

Key words: Articular Cartilage (AC), Calcified Cartilage Zone, Osteoarthritis

Conflict of Interest: None

Funding Source: None

Introduction

The articular cartilage (AC) of knee is a subtype of hyaline cartilage, and is a highly specialized supporting connective tissue present in diarthrodial joints.^{1,2} Articular cartilage has a unique structural organization which gives it specific metabolic properties such as extraordinary resilience to facilitate load transmission with low friction, enabling it to withstand enormous pressure.^{2,3} Adult articular cartilage has a unique structure with a limited repair capacity due to absence of blood vessels, nerves and lymphatics when damaged. The only resident cell type in the articular cartilage is a chondrocyte which maintains the extracellular matrix. The composition of extracellular matrix is mainly collagens, proteoglycans and water. These subcomponents are considered vital for the mechanical properties and are unique to articular cartilage.²

Light microscopic structure of articular cartilage presents four zones. Three of these zones, namely tangential zone, transitional zone and radial zones are non-calcified. Towards the bone the deepest zone is the calcified cartilage zone.³ In all zones, there is abundance of type II collagen which constitutes almost 95% of the total collagen content.⁴ The

chondrocytes reside in lacunae, together called chondrons and in each of the zones, the chondrons exhibit a specific shape, size, number and arrangement. These cells are responsible for the development, maintenance and repair of AC due to their property of synthesizing and turning over the extracellular matrix. They have the capability of maintaining specific microenvironment.⁵

Calcified cartilage layer is the mineralized part of articular cartilage that lies between the upper three zones which are composed of hyaline cartilage and the subchondral bone in the location of synovial joints.^{4,5} The hyaline cartilage is anchored into the underlying bone by collagen fibres through two interfaces of calcified cartilage zone.⁵ The upper interface is the tidemark and this lies between the radial and calcified zones while the lower one is a cement line, connecting the calcified cartilage with the underlying bone.⁵

⁶ The thickness of the calcified zone is measured and is usually about 100 to 300 μm . This thickness is not constant and it increases with advancing age. This zone contains irregularly arranged single, paired or the clusters of chondrons.⁶ This is the zone which thickens with age. This change results in decreased thickness of the hyaline cartilage

portion leading to osteoarthritis. Calcified cartilage zone is the site between bone and cartilage where fracture occurs. The lower interface is cement line and lies between calcified cartilage zone and subchondral bone. The detailed structure is still not well understood but this is made up of collagen proteins.⁷

Age related changes in articular cartilage predisposes to osteoarthritis which is the most recognized age-related joint disorder affecting the life quality by causing pain and disability. This disability is progressive and becomes more evident with advancing age.^{8,9} This disease affects more than 15% of the adult population which makes it the second greatest cause of disability and poor lifestyle worldwide.¹⁰ The cellular density in osteoarthritis is reduced which leads to changes in extracellular matrix secreted by these cells, clustering of chondrocytes, fibrillation and progressive cartilage degeneration. Aging also results in decreased number of cells in articular cartilage initiating the osteoarthritis.¹¹ After the age of forty years articular cartilage start losing the thickness of the upper three zones while the thickness of the calcified cartilage zone is increased during the ageing process.¹¹

The incidence of joint degenerative disease is quite high in Asian population. It was therefore decided to study the zones of ageing male articular cartilage in the knee joint and to formulate a guideline to develop proper preventive and treatment modalities, most suited to our population. Approximately 250 million people in the world are affected. 85% of the affected joint is knee joint. The female is affected more just by 3%. Prevalence increased by 32.7% between the years 2005 – 2015, causing economic burden of USD 89.1 billion per year.¹²

Understanding the structure of articular cartilage is very important in diagnosing and curing joint diseases like osteoarthritis. The susceptibility of articular cartilage to be affected by degenerative diseases and its limited repair capacity has made cartilage the focus of intense study.^{11, 12}

Methodology

The samples were collected from articular cartilages of forty adult male knee joints. They were obtained from Anonymous dead bodies in the Forensic mortuary at King Edward Medical University, Lahore. These bodies were brought early, almost within six hours. The age of dead bodies was between ages 21-60 years. The temperature of mortuary was maintained at 4 degrees centigrade and autopsy was performed within 12 hours. Samples of knees with gross abnormality or deformity and signs of surgery or trauma were excluded.

According to the age of the cadaver, the collected samples were classified in four groups A, B, C and D.

- A Group : age 21 – 30 years
- B Group:: age 31 – 40 years
- C. Group ; age 41 – 50 years
- D Group : age 51 – 60 years

Samples from the articular cartilage of the right femoral condyle of knee joint were taken for measurement. A transverse incision was made on skin at lower femur extending from the lateral to the medial epicondyle. The quadriceps tendon was exposed by retracting the skin. An inverted “U” shaped incision was made on tendon. This started above the patella and was extended to tibial condyles on both sides of ligamentum patellae. The cut tendon and patella were reflected downwards and this exposed the articular cartilage of the femoral condyle. The knee joint was flexed for further exposure and a 1 cm x 1 cm of full thickness articular cartilage was obtained the chisel was used to obtain cartilage from tibial surface of condyle 1 cm medial to medial margin of intercondylar fossa. The specimens were placed in 10 % neutral buffered formalin immediately. It was kept for 48 hours and processed for paraffin embedding. Sections of five micrometre (5µm) thick were cut with the help of a rotary microtome and subsequently mounted on clear albumin-coated slides. H & E staining and Masson’s Trichrome staining was performed and the thickness of the calcified cartilage zone was measured in all.

Results

The study showed that the mean thickness of the calcified cartilage was $109 \pm 20.24 \mu\text{m}$ in group A, $112.30 \pm 13.64 \mu\text{m}$ in group B, $174.5 \pm 43.872 \mu\text{m}$ in group C and $229 \pm 71.75 \mu\text{m}$ in group D. The mean thickness increased from group A to group D and was statistically significant in all study group ($p < 0.05$). Using multiple comparison test we observed that the difference in mean thickness of group A and group B was not significant ($p > 0.05$) while that of group C and group D was significant statistically ($p < 0.05$). The mean thickness of group B was less in comparison to group C and group D ($p < 0.05$). The mean thickness in group C was less when compared to group D and difference was significant ($p < 0.05$) statistically.

Table 1: Descriptive Analysis of Thickness of Calcified Cartilage Zone and Multiple Comparison Test of Thickness in Different Study Groups

		N	Mean ±SD	Minimum	Maximum	
Study Groups	A	10	10.9.0±20.248	95	165	
	B	10	112.30±13.647	95	145	
	C	10	174.50±43.872	125	260	
	D	10	229.0±71.756	150	345	
Total		40	156.20±65.423	95	345	
p- value						
Overall		<i>P < 0.05</i>				
Pairwise	A Vs B	A Vs C	A Vs D	B Vs C	B Vs D	C Vs D
	0.867	0.002	0.000	0.003	0.000	0.009

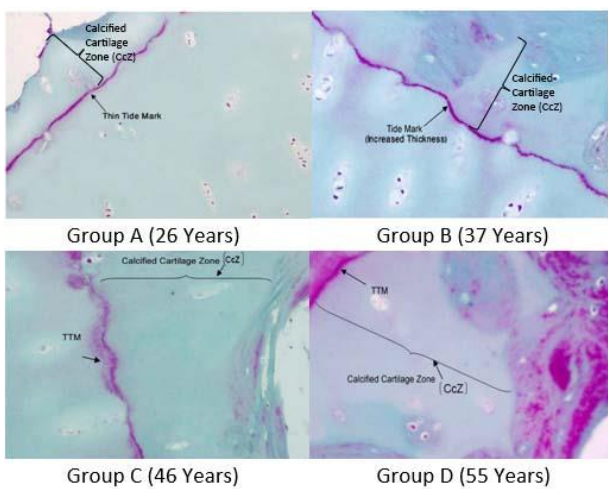


Figure 1: Photomicrograph showing a comparison of the thickness of calcified cartilage zone with advancing age.

Discussion

We found that the mean thickness in the calcified cartilage zone in group A was $109 \pm 20.24\mu\text{m}$, $112.30 \pm 13.64\mu\text{m}$ in group B, $174.5 \pm 43.872\mu\text{m}$ in group C and $229 \pm 71.75\mu\text{m}$ in group D. It was noted that thickness of calcified cartilage zone increased with the advancing age. Due to the increase in thickness of the calcified zone by its progress towards the upper zones, the thickness of hyaline cartilage in the other zones is reduced and compromised. The resilience and weight-bearing are the mechanical properties of articular cartilage and are essential for normal functioning of a joint, so degenerative osteoarthritic changes are observed in the joints with an increase in thickness of the calcified cartilage zone as age advances. In one of the recent research projects, it was observed that subchondral adaptations of articular cartilage start prior to the degradation of the overlying hyaline cartilage, and a moderate correlation in the increase of calcified zone is observed in aging.¹³ The findings of our

present study were the same as Portier H S et al in 2020 who observed that thinning of articular cartilage with aging was due to surface degradation as well as an increase in the thickness of calcified cartilage zone which resulted in the reduction of the thickness of hyaline cartilage in the upper three zones.¹⁴ Huang et al, in 2021 identified a very crucial role of calcified cartilage in repair process of an articular cartilage. They created a full thickness defect in trochlear cartilage of minipigs and assessed by macroscopic observation, MRI examination, and histological observation that the autologous stem cells injected in the calcified cartilage zone repaired the defect with hyaline cartilage while those injected in control and noncalcified zones produced fibrous tissue. This further indicates the importance of keeping the CCZ within its normal ratio in the aging cartilage, not only to maintain the upper three cartilaginous zones in normal proportions but also because of its very important role in the repair process for compensating the effects of degenerating changes in the upper cartilaginous zones and make this zone a focus for research in osteochondral tissue engineering.¹⁵

Conclusion

The thickness of calcified cartilage zone in knee increased with age which results in the disturbance of the normal zonal ratio of hyaline cartilage with calcified cartilage leading to osteoarthritis.

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Comparative Study of Prophylactic Vs Conventional Phenylephrine Administration in Preventing Spinal Anaesthesia-Induced Hypotension in Elective caesarean Section Patients: A Quasi Experimental Trial

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Abstract

Objective: To determine the prophylactic effect of phenylephrine in patients undergoing spinal anaesthesia in comparison to the conventional group.

Study design: Quasi experimental trial.

Place and duration of study: HIT Hospital Taxila in the period of 6 months.

Materials and methods: This quasi-experimental trial was conducted in HIT Hospital. Total 68 females were divided into two groups: Control group and Experimental group. Each group consisted of 34 patients aged between 20 to 40 years. The patients were scheduled for elective cesarean section deliveries under spinal anaesthesia. All patients of the experimental group were given prophylactic dose of phenylephrine 100mcg diluted in normal saline after undergoing spinal anaesthesia before the start of procedure. Control group patients were only given normal saline as a placebo after undergoing spinal anaesthesia before the start of procedure. Control group patients were given phenylephrine as conventional treatment only if they experienced hypotension during the procedure.

Results: Among the patients in the experimental group none experienced hypotension. Their blood pressure remained fairly constant in the normal range. In the control group, 4 out of 34 patients (11.7%) had their blood pressure dropped below the cutoff point of 90/60 mmHg.

Conclusion: Our results show that a prophylactic dosage regimen i.e., 100mcg of phenylephrine is effective in controlling spinal -anaesthesia -induced hypotension in patients undergoing Caesarean-section. In comparison with conventional group where hypotension occurs only in few patients.

Keywords: Spinal Anaesthesia -Induced Hypotension, Phenylephrine, Prophylactic Treatment, Blood Pressure

Conflict of Interest: None

Funding Source: None

Introduction

Elective caesarean sections are one of the most common procedures performed in gynaecology. Most of these procedures (around 80-90%) are performed under spinal anaesthesia because of its rapidity of action, efficacy, and safety. However, a number of undesirable side effects have

been reported which include hypotension, post-spinal headache, and failure of anaesthesia induction.¹ Post-spinal hypotension is a worrisome side effect that can affect more than 50% of patients if steps are not taken to prevent it. Furthermore, prolonged maternal hypotension negatively affects fetal well-being by decreasing uteroplacental blood

flow ultimately leading to compromised fetal oxygenation.^{2, 24}

A lot of research has been undertaken to prevent this phenomenon of hypotension during spinal anaesthesia. Proposed solutions include intravenous fluid administration for volume expansion as well as the use of sympathomimetic drugs. Intravenous fluids alone have not proven to be of much benefit when used alone for this purpose.³ Thus, a variety of sympathomimetic drugs like phenylephrine, ephedrine, mephentermine, epinephrine, and dopamine have been used with varied levels of success to counter spinal anaesthesia -induced hypotension.⁴⁻⁶ However, phenylephrine is superior to other vasopressors due to its high efficacy, being easy to titrate, and ability to use liberal doses to maintain maternal blood pressure near normal without causing fetal acidosis.⁷ Furthermore, its usage in combination with ephedrine decreases the incidence of hypotension, need of vasopressors and antiemetics and improves the fetal APGAR scores.⁸ The dosage regimen of phenylephrine has always been a matter of interest among anaesthesiologists. Various studies have proposed different dosage regimens of vasopressors for the treatment of spinal anaesthesia -induced hypotension. Some studies have used bolus dosing during the surgical procedure only in response to hypotension, as conventional treatment⁹ while others have proposed a prophylactic dosage regimen before the start of procedure.¹⁰⁻¹² However, the literature regarding prophylactic bolus dosage is scarce because no proper guidelines are available. Thus, we designed this study to check the efficacy of prophylactic bolus dosage regimen of phenylephrine in the prevention of spinal anaesthesia-induced hypotension in pregnant women undergoing Lower Segment Caesarean Section.

Materials and Methods

The sample size was calculated through Openepi software using 95% confidence interval, 99% power of study, and anticipated frequency of hypotension 71.1% in control group and 15.5% in experimental group.^{13, 14} In order to reduce the chances of dropout, we inducted 34 patients in each group.¹⁴ Before the start of study ethical permission was taken from IRB committee of HITEC-IMS Taxila. This quasi-experimental trial was conducted at HIT Hospital Taxila over a period of 6 months, from February 2021 to August 2021. All the patients aged between 20-40 years and were scheduled to undergo elective C-section under spinal anaesthesia were included in the trial. These patients were made to go through pre-anaesthesia checkups from specialist anaesthetists and were declared fit for surgery. The drug bupivacaine (administered via central neuraxial anaesthesia /subarachnoid block) at dose of 0.3

mg/kg of body weight was given to patients for spinal anaesthesia. Patients who were hypertensive or already taking anti-hypertensive medications were excluded from the study. During the process of taking patient consent, they were briefed about the treatment and possible outcomes of the study and were divided into experimental and control groups. All patients in the experimental group were given a prophylactic 100 mcg bolus dose of phenylephrine diluted in normal saline after undergoing spinal anaesthesia before the start of procedure. Control group patients were given normal saline as a placebo after undergoing spinal anaesthesia before the start of procedure and were given 100-200 mcg of phenylephrine as conventional treatment only if they experienced hypotension during the procedure. The acceptable cut-off for hypotension, below which conventional treatment would be required was set at 90/60 mmHg. Upon arrival to the operation theatre, patients were given 5 minutes to stabilize after which three blood pressure and pulse readings were taken 1 minute apart and their mean recorded as the baseline pulse and blood pressure. The monitoring was done by 3-lead electrocardiogram. Pulse, systolic, and diastolic pressure were measured every 2-3 minutes after anaesthesia.

Measurements were repeated and recorded at 5, 8, 12, and 15 minutes during the surgery. The strategy was made that if the bradycardia occurred below 50 beats per minute along with hypotension, atropine will be administered as required dose i.e., 0.5-1mg bolus (with repeat doses every 3-5 minutes up to 3 mg if necessary). If there was still no response, then dopamine infusion will be given to manage this condition.⁴ This management of the complication is explained in the guidelines of American Heart Association. The data was analyzed using SPSS version 22. Independent sample t-test was used to compare the baseline mean blood pressure and pulse at different time intervals of both experimental and control group after administering spinal anaesthesia. *P* value of <0.05 was considered as significant

Results

The mean values of age, pulse, blood pressure are given in table 1. (Mean value for the normal parameters)

Parameters	Experimental Group (Mean±SD)	Control Group (Mean±SD)
Age (years)	28±8.56	28.76±9.70
Pulse(bpm)	90.00±12.46	83.147±8.95
Blood Pressure Systolic	122.2±11.33	120.08±5.85

Blood Pressure Diastolic	76.12±9.05	75.88±6.88
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Among the patients in experimental group who received prophylactic dosage of 100 mcg of phenylephrine, none experienced hypotension or bradycardia. Their blood pressure and pulse remained fairly constant in the normal range. On the flip side, 4 out of 34 patients (11.7%) in the control group had their blood pressure dropped below the cutoff point of 90/60 mmHg where they had to receive rescue bolus of phenylephrine to counter it as conventional therapy. The blood pressure of these four patients 1,2,3 and 4 on 3 min of reading was 75/55 mmHg, 80/58 mmHg, 85/50 mmHg and 85/50 mmHg respectively. Bradycardia was observed in few of the patients in control group but not severe that required atropine or dopamine.

From our data, two patients from the experimental group experienced bradycardia. The first patient had a pulse of 56 at 3 minutes and 55 at 5 minutes. The other patient had the pulse of 59 at 5 minutes. The first patient had a pulse of 65 at 8 minutes that is why she did not receive atropine. The second patient who experienced bradycardia had a pulse of 75 at 8 minutes that is why she also did not receive atropine because normal physiological functions restored it to the point where no treatment was required. None of the other patients in the group required bolus dose of phenylephrine.

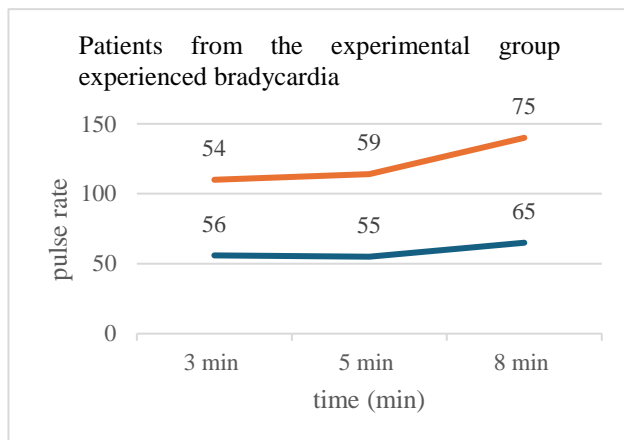


Figure 1: Patients from the experimental group experienced.

From the above-mentioned Table 2, it is visible that the patients in experimental group who received phenylephrine prophylactically did not appear to be hypotensive however there was a mild decrease in the pulse that is considered insignificant. During the BP monitoring at 5- and 12-minutes interval, a significant difference was observed in the blood pressure readings between the control and experimental group (Table 2).

Discussion

Different techniques have been proposed to counter maternal hypotension post-spinal anesthesia. Some studies have shown that intravenous (IV) fluids^{15,16,22} are effective while others suggest using various kinds of vasopressors.^{7-9,14,17}

According to the International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anesthesia, alpha agonist drugs are the most appropriate agents in treating or controlling hypotension, and among all the different types of alpha-agonist drugs, phenylephrine is currently the recommendation of choice due to the amount of supporting data that is present.¹⁸

Table 2: Comparison of Pulse (bpm), Blood Pressure (mmHg) Systolic and Diastolic at 3,5, 8, 12, and 15 minutes in both groups.

Parameters	Experimental Group (Mean±SD)	Control Group (Mean±SD)	Statistics p-value
Blood Pressure Systolic 3 min	118.65±14.11	115.09±15.01	0.363
Blood Pressure Diastolic 3 min	72.11±12.83	72.70±9.71	0.832
Blood Pressure Systolic 5 min	121.62±8.47	115.85±11.61	0.037
Blood Pressure Diastolic 5 min	78.38±8.29	72.26±9.47	0.003
Blood Pressure systolic 8 min	120.38±9.32	117.76±10.57	0.283
Blood pressure diastolic 8 min	80.71±6.38	73.24±7.77	0
Blood pressure systolic 12 min	120.41±8.64	117.00±8.16	0.199
Blood pressure diastolic 12 min	79.73±6.45	74.00±6.45	0
Blood pressure systolic 15min	120.85±6.5	119.53±7.4	0.501
Blood pressure diastolic 15 min	81.26±6.86	76.00±7.27	0.003
Pulse 3 min	91.35±14.7	83.32±8.7	0.086
Pulse 5 min	90.47±14.0	83.70±7.44	0.022
Pulse 8 min	87.94±12.0	82.38±6.8	0.018
Pulse 12 min	84.62±16.21	111.68±15.5	0.317
Pulse 15 min	85.03±9.01	85.82±7.8	0.646

A healthy fetus can withstand the changes in blood circulation but an already compromised fetus can suffer from devastating effects.^{19, 20} For many years, it has been known that the use of vasopressors during pregnancy could harm the fetus as they can decrease the uteroplacental blood flow or they may have direct effects on the fetus.²⁰ But different drugs can have variable effects on the fetus, some can be beneficial for the fetus i.e. a study showed that Phenylephrine is associated with a lower incidence of fetal acidosis and maternal nausea and vomiting as compared to ephedrine. The reason for fetal acidosis associated with ephedrine could be due to decreased uteroplacental blood flow caused by either decreased maternal artery pressure, uteroplacental vasoconstriction or by a direct fetal effect of ephedrine.¹⁹

However, use of phenylephrine is not completely risk-free as there is a possibility of dose-dependent maternal bradycardia while using this drug. A comparative study is conducted using different infusion rates of phenylephrine showed that patients receiving 50µg/min had significantly less bradycardia as compared to patients receiving 100µg/min¹³. Some of our patients also witnessed a decrease in pulse levels only at some times during the procedure but the pulse did not drop below 50bpm and a decrease in pulse rate was not associated with any complications, so they did not require any intervention. Nevertheless, use of vasopressors during any surgical procedure should be done with caution as there are chances of organ damage like acute kidney injury.²¹

Referring to the question that which dosage regimen is the most effective, a double-blind trial comparing the effects of bolus vs continuous infusion regimen did not find any difference in outcome in regard to hemodynamic effects.¹⁷ Another study showed that in patients receiving spinal anesthesia for elective cesarean delivery, a prophylactic phenylephrine infusion decreased the incidence and level of hypotension but with no change in neonatal outcome in comparison with a patient in control group which received IV bolus phenylephrine on requirement.¹⁴ This control/conventional group was basically made to limit the use of drug to only those patients undergoing fall in blood pressure. We also compared the use of prophylactic vs conventional phenylephrine administration in preventing post spinal anesthesia hypotension in elective caesarean section patients. Our study showed that prophylactic regimen of phenylephrine is better in controlling blood pressure than rescue boluses alone without causing any significant adverse effects because that can risk very low blood pressure in conventional group where only conventionally used

Another popular method is to administer IV fluids either before or during the administration of spinal anesthesia.

Administration of colloids has been observed to be more effective against spinal anesthesia-induced hypotension when used before giving the anesthesia as they have a longer half-life in the intravascular compartment while crystalloids are considered better than colloids when given during the administration of anesthesia.^{16, 22} Excessive and unchecked fluid resuscitation can lead to terrible effects like edema of various vital organs¹⁵.

Recent consensus demands that a multimodal approach should be used to counter this problem. Although volume therapy alone is hardly effective in controlling hypotension during spinal anesthesia, simultaneous volume therapy decreases the amount of vasopressor required to achieve therapeutic goals. A review stated that rapid pre-loading with a colloid is effective in combating hypotension, and it also causes less vasopressor to be administered.²³

From this discussion, it is evident that maternal hypotension during spinal anesthesia is a preventable problem. Of all the drugs phenylephrine has the best results to prevent post-spinal anesthesia hypotension when used prophylactically. Also, the dose of vasopressor being used can be decreased by simultaneously using a volume expander.

In our study, patients who were hypertensive or those who were already taking any anti-hypertensive medications were excluded from the study. All those patients undergoing this C-section were under close monitoring and blood pressure was being maintained at the normal limits. An exception occurred in only a few patients where blood pressure was falling below the mentioned limit of 90/60 mmHg that was then maintained by bolus of phenylephrine vasopressor along with IV infusions during procedure in the control group. While the experimental group was already administered the drug mentioned before the start of procedure according to methodology. A study can be done to compare the use of phenylephrine administration in hypertensive and normotensive patients undergoing spinal anesthesia during elective cesarean sections. In the future research can be done to compare the simultaneous use of multiple vasopressors along with volume expanders while monitoring maternal and fetal well-being. Long-term fetal follow-ups should be done to observe any prolonged side effects.

Conclusion

According to our results, it has been shown that prophylactic dosage regimen of phenylephrine is more effective in controlling spinal anesthesia-induced hypotension in patients undergoing C-section. While in comparison of conventional therapy there is still a risk of fall in blood pressure that required thorough monitoring along with rescue doses of phenylephrine. As it was a quasi-experimental study, next randomized clinical

studies in Pakistani setup are required in this regard to explore the concomitant usage of volume expansion methods and their effect on hypotension during spinal anesthesia.

Conflict of Interest

The authors declare that there is no conflict of interest.

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5. Dr. Hassam Nasir Khan Alizai (Drafting)
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Efficacy of Empirical Co-Amoxiclav Vs Culture Directed Treatment in Chronic Suppurative Otitis Media. A Double Blind Randomized Controlled Trial

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Abstract

Background: Chronic suppurative otitis media (CSOM) is common middle ear inflammatory condition secondary to tympanic membrane perforation and superimposed infection, which causes increased discharge from middle ear mucosa. This is a common condition seen in relatively low socioeconomic status and in younger population. The effective treatment of this disease is essential as un-treated patients often lead to various complications like mastoiditis, facial nerve paralysis, labyrinthitis and abscess formation. A huge number of hearing loss in paediatric population is due to this condition. The treatment of CSOM includes aural toilet, topical antibiotics and in some cases systemic antibiotics. In this study we will compare the results of patients who were given culture sensitivity directed antibiotics with the ones who were given Co-Amoxiclav as an empiric treatment.

Methodology: A two-year observational cross-sectional study was conducted at PIMS, a total of 396 patients were enrolled and randomly divided into two group i.e., Group A and Group B with 198 patients in each. Group A included those who were given culture specific antibiotics and group B included those who were given Co-Amoxiclav as a part of empiric therapy. Their results were compared after 12 days of treatment in terms of response seen as clean and dried, external auditory canal along with middle ear mucosa.

Results: Out of 198 patients in Group A, 177 patients had clean and dried middle ear mucosa which shows success rate of 89.39% and in Group B 170 patients out of 198 (85.85%) showed positive response.

Conclusion: Empiric treatment of CSOM (Tubotympanic Type) with co-amoxiclav must be considered as its response is comparable to culture sensitivity directed treatment in terms of clean and dried external auditory canal and middle ear mucosa.

Keywords: CSOM, Chronic Suppurative Otitis Media, Culture Sensitivity, Antibiotics, Empiric Therapy.

Conflict of Interest: None

Funding Source: None

Introduction

Chronic suppurative otitis media commonly known as CSOM is an inflammatory condition of middle ear causing inflammation of its mucosa with increase discharge with its predominance in developing countries.¹⁻³ Despite all the associated complications like hearing loss, mastoiditis, facial nerve paralysis, labrynthinitis and abscess formation.⁴⁻⁵ It is still a neglected disease in developing countries including Pakistan. Another study in Islamabad in 2009 concluded that prevalence of CSOM not only depends on the

economic status but also on living standards i.e., health and sanitation facilities and awareness of people.⁶

CSOM is broadly classified into two, tubotympanic or mucosal disease and atticointral or squamosal disease, the former one is relatively safe with lesser complications.

Microbiological agents involved in chronic suppurative otitis media are well studied. The frequently isolated bacteria are *Staphylococcus Aureus*, *Proteus*, *Pseudomonas aeruginosa* and *Klebsiella* species.⁷ Despite advanced knowledge of microbes, treating this

condition is challenging, due to Poor compliance and lack of awareness.

First line of treatment for CSOM Tubotympanic type is topical and systemic antibiotics but seeing the recent ototoxic results of some topical antibiotics particularly aminoglycosides, corticosteroids solvents and preservatives,⁸ their use in the treatment has become very limited. However, in countries like Pakistan it is still being prescribed as mainstay of treatment.

In this study we will compare the role of cultural sensitivity directed treatment of CSOM with empirical treatment in terms of response seen as clean and dried external auditory canal and middle ear mucosa.

Methodology

This two-year comparative observational cross-sectional study was conducted after the approval of ethical review board from January 2019 to December 2020, among CSOM patients presented in ENT Clinic of Pakistan Institute of Medical Sciences, Islamabad after taking informed consent. A datasheet was prepared including patient’s history, age, symptoms and a thorough ear examination. Analysis including calculation of mean values of a comparison between cultural directed and empirical treatment treated patients was done with the help of SPSS Version 21.

A total of 396 patients who were presented with purulent ear discharge were included in the study and were divided randomly into two groups. Group A included those patients whose ear discharge were sent for culture and sensitivity to the microbiological lab. Sterile cotton swab was used for this purpose. The pus swab was cultured on blood and MacConkey agar and incubated for 37 Degree Centigrade overnight. Group B patients were given empirical treatment which included Co-Amoxiclav for 12 days. The response of both groups was evaluated from the improvement of patients’ symptoms and examination of ear that whether the purulent discharge became scanty/completely disappeared or not.

Results

We calculated sample size by using the WHO sample size calculator, and kept the confidence interval at 95%, Also the desire of power at 0.8; with 2-tailed hypothesis.

A total of 396 patients were divided into (A & B) two groups with 198 individuals in each group. Group A included those patients who were given culture sensitivity directed antibiotics and group B included those who were given co-amoxiclav. In this study 210 (53.03%) were female and 186 (49.49%) were male as shown in table 1. Most of the patient included in this

study belonged to younger age group with predominance between 20-29 years of age (30.05%) as depicted in table 2.

Table I: Gender Distribution of both study groups

	Male		Female	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Group A	100	50.51	98	49.49
Group B	86	43.43	112	56.56
Total	186	46.96	210	53.03

Table 2: Age distribution of both study groups

Age Group (years)	Frequency	Percentage (%)
19-Oct	101	25.5
20-29	119	30.05
30-39	106	27.27
40-49	39	26.76
50-59	21	5.3
60-69	9	2.27
70-79	1	0.25

Table 3: type of organism obtained from culture growth

Organism cultured from ear discharge		
Type Of Organism	Total Isolate	Percentage (%)
Pure Growth	154	77.77
Mixed Growth	30	15.15
No Growth	14	7.07
Total	198	100

Out of 198 culture study done, 154 (77.77%) reported pure growth, however 30 (15.15%) showed mixed flora as shown in table 3. Most common organism involved was *Staphylococcus Aureus* n=80 (43.47%) followed by *Pseudomonas Aeruginosa* (33.69%) and *Methicillin Resistant Staphylococcus aureus* (11.41) as seen in table 4.

Table 5 showed that the most common organism isolated in pure growth was staphylococcus aureus with (46.74%) while in mixed flora there was predominance of pseudomonas aeruginosa (43.33%). The antibiotic sensitivity of three most common organism is depicted in table 6. Most of the organisms were sensitive to co-amoxiclav and gentamycin. Patients were given culture directed antibiotics and were kept on close follow-up.

Patient response to these antibiotics was seen after 2 weeks in terms of clean and dried ear. It was compared with the results of Group B. Not large difference was noted between two as group A showed treated percentage of 89.39% and those of Group B is 85.85% respectively as shown in table 6.

Table 4: Common Organisms Isolated from Ear Discharge

Organisms involved in discharge (n=184)		
Type of organism	Total Isolate	Percentage (%)
<i>Staphylococcus aureus</i>	80	43.47
<i>Pseudomonas aeruginosa</i>	62	33.69
MRSA	21	11.41
<i>Proteus</i>	13	7.06
<i>Klebsiella</i> species	8	4.34

Table 5: Distribution of Microbes According to their Flora

Organisms in the Discharge (n=184)					
Type Of Organism	Total Isolate	Pure Growth		Mixed Growth	
		n=154		n=30	
		n	%	n	%
<i>Staphylococcus aureus</i>	80	72	46.74	8	26.66
<i>Pseudomonas aeruginosa</i>	62	49	31.81	13	43.33
MRSA	21	18	11.68	3	10
<i>Proteus</i>	13	10	6.49	3	10
<i>Klebsiella</i> species	8	5	3.24	3	10

Table VI: Antibiotic Sensitivity According to Organism

Type of organism involved	Antibiotic Sensitivity (Test)							
	Co-amoxiclave	Ceftazidime	Gentamycin	Linezolid	Tobramycin	Amikacin	Imipenem	Erythromycin
<i>Staph. aureus</i>	S	S	S	S	R	S	S	R
<i>P. aeruginosa</i>	S	S	S	S	S	S	R	S
MRSA	R	R	S	S	S	R	S	R

Note: *S – Sensitive, *R – Resistance

Table 7: Patient Response to the Treatment

Patient Response	Group A			Group B		
	n=198			n=198		
Clean and dried middle ear mucosa	Yes	No	Percentage (%)	Yes	No	Percentage (%)
		177	21	89.39	170	28
	<i>p</i> -value		<i>P</i> > 0.05			

Discussion

The mainstay management for chronic suppurative otitis media includes aural toilet along with topical antibiotics; however, the role of systemic antibiotics is not well established. In south Africa treatment the cultures are not routinely obtained and treatment is mostly empirical.¹⁰ In our study females were affected more 53.03% as compared to males 46.96% which similar to findings of Loy et al.,¹¹ but differs from study by Ahmed et al.¹² As our study consisted of random selection of cases this prevalence may be an incidental finding.

Mono microbial growth was present in 77.77% of our patients which is similar to the study conducted by Agarwal et al.¹³ This observation was also supported by many other studies.^{14,15,16,17} In present study 30 (15.15%) showed mixed growth while 14 (7.07%) showed no growth. This is similar to work done by Vijaya et al.¹⁸ who found 5.28% sterile samples. Whereas studies by Fatma et al.¹⁹ (16.9%) and studies by Chakraborty et al.²⁰ found an even higher percentage of negative growths in their cultures.

Staphylococcus aureus and *Pseudomonas aeruginosa* were grown in majority of cultures. This was similar to work done by Shyamala et al.,²¹ Iseh, & Adegbite et al., and Aslam et al.^{22,23,24}. In these studies, the

Staphylococcus Aureus showed high sensitivity to Co-Amoxiclav, Ceftazidime, Gentamycin, Linezolid, Tobramycin, Amikacin and Imipenem however resistance to erythromycin. On the other hand, Pseudomonas showed sensitivity to Co-Amoxiclav, Ceftazidime, Gentamycin, Linezolid, Tobramycin, Amikacin and Erythromycin and resistance to Imipenem. In this study 85.85% patients who were given empiric treatment with co-amoxiclav showed positive response to treatment which is comparable to 89.39% patients who were given culture-sensitivity directed antibiotics.

Conclusion

Empirical treatment of CSOM must be considered as its results in terms of clean and dry ear mucosa are comparable to culture-sensitivity directed treatment.

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Perception of Fresh Graduates and new Academic Faculty Regarding Specialty of “Health Professional Education” as a Career- A Multicentre Study in Pakistan

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Abstract

Objectives: To gain insight into emerging medical professionals’ awareness and willingness to choose health profession education as their career.

Methodology: A cross-sectional questionnaire-based study was conducted in 3 institutes Wah Medical College (Wah Cantt), UMDC (Lahore), Sardar Begum Dental College and Kabir Medical College (Peshawar) and allied hospitals. The participants were selected via convenience sampling. MBBS and BDS graduates were included in the study. Data was collected using a self-administered questionnaire using nominal YNDK scale used to evaluate the understanding regarding Health professional education. Data was collected and analyzed in SPSS version 23.

Results: Eighty-five participants completed the questionnaire with equal male female ratio. The participants were well aware of the field and were well acquainted with MHPE. A significant number of participants agreed on making it part of undergraduate curriculum as 67% of them faced difficulties during their undergraduate studies. 91% encouraged Health professional education training at their institutes and 70% of them have Health professional education department. PBL and OSCE were known to 55.3% and 88.2% respondents respectively. Experience alone cannot make one a good teacher was expressed by 71.8% participants while 47.1% respondents command on subject is enough for being a good teacher. 65.9% participants stated that Health professional education is a demanding that involves active teaching not merely a managerial job.

Conclusion: Our results highlight the need for more research into how medical professionals see health profession education. The ever-changing healthcare landscape requires educational programs that are in line with potential students’ knowledge base and objective to enhance health profession education that develops a skilled and driven healthcare workforce in Pakistan.

Key words: Health Professions, Education, Career, Academic Faculty

Conflict of Interest: None

Funding Source: None

Introduction

In many other nations, Health professional education has become a prominent new specialty; but, in Pakistan, this recognition is relatively slow. In Pakistan, a regulatory body PM&DC makes sure that all medical institutions uphold the highest standards of Health professional education and keep track of all accredited medical schools in country. Pakistan has a large number of medical universities and colleges across the country both

in public and private sector The number of postgraduate programs in the field of Health professional education that have grown enormously in the last 20 years. In this country almost ten and around 126 programs internationally are offered in this emerging specialty. This (7–126+) is indicative of the heightened interest in this discipline.¹ It's critical to comprehend the perspectives are very bright for those entering and influencing the healthcare education in order to

guarantee the next generation of qualified healthcare workers.

In order to provide a complete picture of the current situation of Health professional education in Pakistan, this study will examine the perspectives of both new faculty members and recent graduates. This multicenter study explores the perspectives of two important groups: recent medical graduates and newly hired academic faculty. We hope to learn important information by investigating their opinions on Health professional education as a career route, which includes; Experiences of recent graduates: their reasons for choosing to enter this field, how happy they felt with their educational experience, and any difficulties they ran into. Whereas Fresh viewpoints from faculty: It can be insightful to consider how new faculty members see their role in training the next generation of physicians and a kind of professional development and support they require in academic settings.

In the end, the results can be utilized to create focused plans for drawing in and keeping the best students while also making sure medical school stays current and graduates are ready for prosperous employment in the rapidly changing healthcare industry. There is an increasing need for supervision and training in this competency area as interprofessional teamwork and collaboration in health care become more important parts of a healthcare professionals' job.²

A formal degree in health professional education is necessary since there aren't enough competent health professions educators in the country to match the standards in Health professional education. Improvements to the health education system were started in Pakistan earlier in 1978. An attempt was made to raise awareness of the developments, fresh perspectives, and goals of health professional education. Furthermore, fast and sufficient action was needed to enable their integration into the health professional's curriculum. Around the world, numerous educational initiatives are being developed to offer formal health professional education. Workshops, certificate programs, master's degrees, and doctorates in Health professional education are available, with durations ranging from a few days to many weeks or years. These instructional initiatives will support and educate people about health experts in the development, application, and assessment of diverse teaching and learning methodologies. It is anticipated that by laying the groundwork for high-quality education, this initiative will contribute to the production of qualified, skilled, and competent health care practitioners for society.

This study has link to cognitive evaluation theory that suggests the two motivational systems extrinsic and intrinsic. The extrinsic factors include grades, accomplishments or failures, pay, promotions.³⁻⁵ Intrinsic motivators refer to the drive or interest in the task itself or exists within the individual rather than external forces. The current study has been carried out to investigate the basic knowledge of Health professional education and willingness of medical professionals' young to make it career preference. The goal of this study is to have an insight on emerging medical professional's willingness to choose health professions education as their career and their basic understanding of Health professional education.

Methodology

This study utilized the cross-sectional analysis to provide insights about Health professional education among young graduates. The study design implicated was cross-sectional, observational questionnaire-based study. The sampling technique was non-probability convenience type. The study was conducted in 3 institutes of Punjab and KPK. The study setting was Wah Medical College (Wah Cantt), University Medical and Dental College (Lahore), Sardar Begum Dental College and Kabir Medical College (Peshawar) and allied hospitals.

MBBS and BDS graduates who successfully completed 5 and 4 years of education were part of the study respectively. The graduating students and senior faculty members were not included in the study. Data were collected using a self-administered questionnaire which was inspired from the available literature as evidence-based research. A questionnaire designed based on nominal YNDK scale was used to evaluate the understanding of the health professional education.⁶ It was developed by two to three experts in the department of Health professional education and the validity and reliability tested by piloting. After piloting the link of pretested questionnaire was shared with the participants. The questionnaire addressed main areas comprising demographic data, information about Health professional education, its requirement, teaching and assessment methodologies.

Collected data were entered in and analyzed using the SPSS software version 23. Categorical variables were presented as counts and proportions. Mean score \pm its standard deviation for each quantitative variable were calculated. Qualitative variables were expressed in graphs and charts. Relationships between categorical variables were tested by Chi-square test.

Results

Out of 100, 85 eligible participants completed the questionnaire. Among all respondents, almost equal number of males and females participated in the study. 57.6% of participants had done MBBS while 42.4% were BDS graduates. The study was conducted in 4 institutes whereas maximum number of participants were from UMDC, Lahore.

The main factors for decision to pursue Health professional education as a career was considering it having a bright future as shown in figure 1. The awareness about post-graduation in Health professional education was among almost all participant and maximum number of people were more acquainted with MHPE as a post-graduation program. But half of them had not seen any advertisement related to jobs in Health professional education. 60% people agreed on making health professional education a part of undergraduate curriculum and the relationship between opting Health professional education as a career and its future prospects was significant (P -value < 0.05).

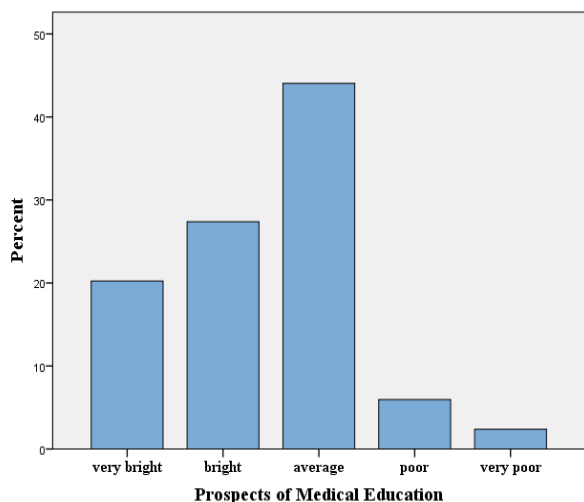


Figure 1: Future Prospects of Health professional education

Graduates who faced difficulties during their graduation (67%) most of them had problem with assessments followed by learning and finances. Few of them had mentioned other issues like favoritism, stress from environment and lack of interest in medicine. About 91% participants encouraged the training in Health professional education at their workplace. About 70% of the respondents have department of Health professional education at their workplace but few of them have an active department. 2 of the respondents quoted as “department exists but managed by other departments faculty”. The requirement of Health professional educationist was highlighted by most of the people and

half of them referred it as a shortcut to achieve a senior post as shown in Table 1.

Factors	Percentage (%)
Requirement of basic training in Health professional education	90.6
Need of qualified health professional educators	90.6
Health professional education need of the hour	87.1
Contentment with educational environment	68.2
Shortcut to senior post	50.6

New and modern learning and teaching tools in Health professional education are well known to respondents like 55.3% people know the PBL whereas as 82% were well aware of OSCE. Few of them had a better idea of TOACS. 88.2% participants think that quality of teaching of academicians can be improved by qualification in Health professional education whereas 85.7% emphasized that overall, Health professional educationist can bring a significant improvement in teaching. Interpretations about subject command and experience are enough for good teaching are expressed in table 2. Most of the people (table 2) claim that Health professional education is not merely a managerial post rather requires good amount of involvement in teaching. AEME, WHO, AMEE and ASME were the organizations related to Health professional education were known to the participants but most of them were unaware of the organizations dealing with Health professional education

	Yes (%)	No (%)
Subject command enough for being good teacher	47.1	52.9
Years of experience is enough for being good teacher	28.2	71.8
Health professional education—a managerial job	34.1	65.9
Knowledge regarding Health professional education organizations	37.6	62.4
Subject command enough for being good teacher	47.1	52.9

Discussion

This study's major aim was to provide an insight about young graduate's perception regarding health professional education and alignment with the career selection criteria. The study helped to explore the priorities of doctors to opt a specialty and reasons for the preference.^{5,6} The data focused on potential of buyer to a specific product i.e. doctor's attraction towards health professional education as a primary specialty. Our study showed most of the people had awareness about health professional education but those who don't have orientation was probably due to not fully developed department of Health professional education or with limitation of resources at their current places and the institutes from where they graduated. A study in Turkey in 2007 among tourism students indicated that the interest and willingness in a career ensures its selectivity for future. It was also emphasized that more the education exposure and personal interest more is the priority for a certain field in addition influence by family also play a role.⁷ The impact of post-graduation and transferring skills is significantly linked with the career selection and work placement. Another study claimed that improving a degree was a prime reason for enhancing job prospects and promotions that coincided with our study.⁹ In opting why to select Health professional education subject was probably due to the problem faced by the people while they are graduation most of the come up with the examination and learning difficulties followed by financial and others.¹⁰ Most of the graduates in our study highlighted the importance of teachers training in improving teaching skills. A study in January 2014 at a hospital in Germany revealed the importance of teacher training and found a significant difference among trained and untrained teachers.¹¹ The importance of Health professional education department in an institute is irrefutable thus it helps to provide the reforms in curriculum, improvement in assessment including evaluation, validation, internal quality control, audit and external quality assessment.¹² A well-developed Health professional education department may evaluate internal and external quality assessment with self-performance, figuring out the problems pertinent to educational process. In addition, it also effects set goals by accurate availability of data and its dissemination and reassurance of best practice. These requirements increase the importance of qualified Health professional educationist in health sectors. The evolution of Health professional education was to fill the gap between the undergraduate and graduate education and align it, thus many organizations internationally put strong efforts to move it from back seat to the original position. In reality,

the introduction of DME into medical and dental institutions is generally seen as a development for the better. Medical colleges can effectively leverage these positive impressions to create and maintain change in Pakistani Health professional education. Health professional educationists in any Health Institutions worked on various aspects of curriculum and clinical training. The introduction of new technologies and knowledge involving changing practices including the environment demanded the revision of curriculum. The change much needed was in basic sciences and its integration with the clinical curricula.¹³ The newer teaching and learning techniques and assessments methods are widely appreciated in our study and all over, because of their significant validity and reliability. New examiners are well aware of these methods and are fairly used in many schools.¹⁴ Case Based learning and Problem Based learning improves learning and retention of knowledge by enhancing critical thinking and reasoning, correlation, time management and responsibility. Moreover, it also enhances communication skills and awareness to own limitations. Thus provides the understanding of clinical appraisal and understanding of evidence-based medicine.¹⁴ The changes in Health professional education are the need of the hour because of need of adult learner and evolution in health care system. Health professions instructors need to pay attention to the opinions of patients, employers, students, and regulators as new service delivery models emerge.¹⁵

Conclusion

Our results highlight the need for more research into how medical professionals see health profession education. The ever-changing healthcare landscape requires educational programs that are in line with potential students' knowledge base and objectives. By illuminating their awareness, aspirations, and knowledge of health profession education, we can tailor curricula and recruitment strategies to effectively attract and prepare future healthcare leaders. In addition, by clarifying the variables impacting their expectations and career decisions, we enhance health profession education to develop a skilled and driven healthcare workforce in Pakistan.

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^{1,5,6} Drafting the work or revising it critically for important intellectual content.

Level of Awareness of Risk Factors for Breast Cancer Among Final -Year Medical Students. A Cross-Sectional Study

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Abstract

Introduction: Breast cancer is one of the most common cancers and the primary cause of cancer-related deaths in women worldwide. Awareness of breast cancer among adults can help to reduce the hazards and uncertainty associated with its delayed diagnosis. This study was planned to determine the awareness of risk factors of breast cancer among male and female students of Final year MBBS of HITEC-IMS, Taxila cantt.

Methodology: All the final -year MBBS students (n=102) at HITEC IMS, Taxila Cantt were inducted in the study through non-probability convenience sampling. A total of 99 students completed the self-administered survey via online Google Forms. Data was analyzed using the chi-square test in SPSS version 28.

Results: Out of a total of 99 students, the female response was more (56.56%) as compared to males (43.43%) with an average age of 22.9±1.607 years. Awareness regarding the role of the use of oral contraceptive pills, hormone therapy, exposure to radiation and family history in increasing the chances of developing breast cancer was generally high for both genders, with no significant differences. A notable gender difference was found in the awareness of early menstruation (P-value = 0.010). Students' awareness regarding the risk factors like high consumption of red meals, low consumption of vegetables and fruits, low physical activity, and starting menstruating before age 12 was relatively low in both genders.

Conclusion: This research emphasizes the importance of targeted educational interventions to enhance breast cancer risk factor knowledge among medical students.

Keywords: Breast Cancer, Awareness, Risk Factors.

Conflict of Interest: None

Funding Source: None

Introduction

Breast cancer, in which breast cells begin an uncontrolled proliferation and produce an undifferentiated cell mass, is the most common malignancy in women and the leading cause of cancer-related death worldwide.¹ It's a worldwide pandemic that affects people of both sexes at the same rate, no matter their age, income, race, or religion.² A disproportionate number of female cancer deaths occur because of breast cancer. Breast cancer is projected to be the most common cancer among American women, accounting for around 30% of all new diagnoses in that year.³ Every year in the United States, breast cancer affects over

264,000 women. In 2020, 2.3 million women around the world were diagnosed with breast cancer, and 0.68 million died. Research suggests that low-income areas account for 60% of all fatalities from breast cancer.⁴ In 2020, the data showed that 7.8 million women were diagnosed with breast cancer within the preceding five years, making it the most prevalent cancer worldwide. In 2020, the World Health Organization reported that breast cancer represented 28.7 per cent of all female cancer diagnoses.⁵ The problem exists in same capacity in Pakistan and there are five times as many cases of breast cancer diagnosed in women as in men.⁶

Male breast cancer is also a significant problem, and there is a limited number of research on creating its

awareness. Studies conducted by Anjana Goyal et al., just 19% of urban males in Delhi were aware that men might get breast cancer.⁷ The American Cancer Society estimated that , 2,710 men were diagnosed with male breast cancer in the year 2022.⁸ The prevalence of breast cancer is also staggeringly high in Pakistan. According to the "Punjab Cancer Registry Report" for the year 2021, published by the Shaukat Khanum Memorial Cancer Hospital and Research Centre, 29.5% of all adult cancer diagnoses were due to breast cancer including males.⁹

The Breast Health Global Initiative (BHGI) proposed that adolescents may be trained in self-examination techniques that would allow for earlier diagnosis of breast cancer.¹⁰ The National Breast Cancer Foundation reported a 99 percent relative 5-year survival rate for women whose breast cancer was detected early and had not spread to other regions of the body. The 93.6% of people in a survey conducted in Bahawalpur claimed to be familiar with the term "breast cancer."¹¹

Adolescent with a personal or family history of breast cancer are also at higher risk for developing this disease.¹² More than 2 million people are expected to be diagnosed with breast cancer worldwide by 2030, with an increasing proportion of those affected residing in emerging nations.¹³ Pakistani undergraduate women surveyed showed insufficient familiarity with breast cancer risk factors.¹⁴ A research conducted in Peshawar, showed that just around a quarter of people surveyed in OPDs of hospital knew the early signs of breast cancer.¹⁵

Educating the public about breast cancer can increase the likelihood that people will follow screening guidelines. Adolescents need to be educated on breast cancer, its causes, and the significance of getting checked out if they exhibit any of the symptoms. Prompt diagnosis might lessen the dangers and uncertainty associated with delayed identification. That’s why this study was planned to determine the awareness of risk factors of breast cancer among final-year students of HITEC-IMS and to find out if there is any difference between the awareness of male and female students.

Methodology

This cross-sectional study was conducted at the HITEC Institute of Medical Sciences from June 2023 to December 2023. Ethical permission was taken from the Institutional Review Board (IRB/EC No: HITEC-IRB-19-2023). A self-administered Proforma was prepared through a detailed literature search. The proforma consisted of 17 questions related to breast cancer risk factors, and students' response was collected through yes,

no or don't know. All the fifth-year MBBS students (n=102) were inducted through non-probability convenience sampling. Students who refused to participate were excluded from the study.

In addition, incomplete survey forms or forms with missing data were not considered for analysis. After getting the informed consent, the proforma was disseminated to participants using online Google forms. Participants were asked to rate their familiarity with each risk factor in the survey. After gathering the information, data analysis was done through SPSS version 28.

The mean and standard deviation (SD) of age and the number and percentages of all other risk factors were calculated. The chi-square test was applied to determine the association of awareness among male and female students.

Results

Out of a total of 102 students, 99 completed the questionnaire. Their response rate was 97%. The participants comprised 56 girls and 43 boys, with an average age of 22.99±1.607 (Table 1). Among the students, 84.84% (n=84) were urban residents, while 15.15% (n=15) hailed from rural areas.

Table 1: Demographic characteristics of the participants (n=99)

Variables		
Gender	Frequency	Percentage
Female	56	56.56
Male	43	43.43
Age	Mean±SD	
	22.99±1.607	

The study delved into various risk factors for breast cancer and examined their awareness among the students. When it came to the use of oral contraceptive pills for more than 5 years, 80.35% of female students and 83.72% of male students reported using them. The difference in awareness between genders was non-significant (P-value = 0.635). Similarly, for hormone therapy after menopause, 87.50% of female students and 86.04% of male students were aware of it, with no significant difference between genders (P-value = 0.316).

Regarding exposure to high radiation to the chest or breast in childhood or adolescence (radiation therapy), 96.42% of female students and 88.37% of male students reported awareness. The difference in awareness between genders, once again, was not significant (P-value = 0.189). When it came to a history of breast cancer in the

family, 96.42% of female students and 90.69% of male students showed awareness, with no significant gender

students, and the difference in awareness was statistically significant (P -value = 0.010). On the other hand, for late menopause (after age 55), 64.28% of female students and

Risk factors		Female		Male		p -Value
		(Frequency)	Percentage (%)	(f) Frequency	Percentage (%)	
Use of oral contraceptive pills more than 5 years	Yes	45	80.35	36	83.72	0.635
	No	7	12.50	3	6.97	
	No Comment	4	7.14	4	9.30	
hormone therapy after menopause	Yes	49	87.50	37	86.04	0.316
	No	4	7.14	1	2.32	
	No Comment	3	5.35	5	11.62	
exposure to High radiation to the chest or breast in childhood or adolescence (radiation therapy)	Yes	54	96.42	38	88.37	0.189
	No	0	0	2	4.65	
	No Comment	2	3.57	3	6.97	
History of breast cancer in family	Yes	54	96.42	39	90.69	0.252
	No	0	0	2	4.65	
	No Comment	2	3.57	2	4.65	
Starting menstruating before age of 12	Yes	34	60.71	16	37.20	0.010
	No	18	32.14	15	34.88	
	No Comment	4	7.14	12	27.90	
Late menopause (after age 55)	Yes	36	64.28	22	51.16	0.411
	No	14	25	14	32.55	
	No Comment	6	10.71	7	16.27	
Giving birth for the first time after age 30	Yes	34	60.71	27	62.79	0.562
	No	16	28.57	9	20.93	
	No Comment	6	10.71	7	16.27	
Not having a childbirth experience	Yes	40	71.42	26	60.46	0.512
	No	9	16.07	10	23.25	
	No Comment	7	12.50	7	16.27	
Having low physical activity	Yes	28	50	19	44.18	0.646
	No	21	37.50	20	46.51	
	No Comment	7	12.50	4	9.30	
High consumption of fatty foods	Yes	32	57.14	25	58.13	0.876
	No	17	30.35	14	32.55	
	No Comment	7	12.50	4	9.30	
Low consumption of vegetables and fruits	Yes	25	44.64	20	46.51	0.977
	No	22	39.28	16	37.20	
	No Comment	9	16.07	7	16.27	
stress	Yes	35	62.50	27	62.79	0.632
	No	15	26.78	9	20.93	
	No Comment	6	10.71	7	16.27	
Smoking or alcohol consumption in the past or present	Yes	48	85.71	38	88.37	0.924
	No	3	5.35	2	4.65	
	No Comment	5	8.92	3	6.97	
Lack of breastfeeding	Yes	49	87.50	36	83.72	0.425
	No	6	10.71	4	9.30	
	No Comment	1	1.78	3	6.97	
High consumption of red meat	Yes	25	44.64	12	27.90	0.168
	No	19	35.92	22	51.16	
	No Comment	12	21.42	9	20.93	
Overweight and obesity	Yes	42	75	37	86.04	0.384
	No	8	14.28	3	6.97	
	No Comment	6	10.71	3	6.97	
age above 40	Yes	45	80.35	37	86.04	0.394
	No	5	8.92	1	2.32	
	No Comment	6	10.71	5	11.62	

difference (P -value = 0.252).

Starting menstruating before the age of 12 was reported by 60.71% of female students and 37.20% of male

51.16% of male students reported having late menopause, and the difference in awareness between genders was not found to be significant (P -value = 0.411). Similarly, for giving birth for the first time after

age 30, 60.71% of female students and 62.79% of male students reported such awareness, and again, there was no significant difference between genders (P-value = 0.562). The awareness of not having a childbirth experience was reported by 71.42% of female students and 60.46% of male students, with no significant difference between the genders (P-value = 0.512).

Regarding low physical activity, 50% of female students and 44.18% of male students reported having low physical activity, and the difference in awareness between genders was non-significant (P-value = 0.646). The awareness of high consumption of fatty foods was reported by 57.14% of female students and 58.13% of male students, with no significant difference between the genders (P-value = 0.876). Similarly, for low consumption of vegetables and fruits, 44.64% of female students and 46.51% of male students reported such awareness, and the difference in awareness between genders was non-significant (P-value = 0.977).

Moving on to lifestyle factors, 62.50% of female students and 62.79% of male students were aware of stress as a risk factor for breast cancer, with no significant gender difference (P-value = 0.632). Similarly, for smoking or alcohol consumption in the past or present, 85.71% of female students and 88.37% of male students were aware, and the difference in awareness was not significant (P-value = 0.924). Lack of breastfeeding was recognized as a risk factor by 87.50% of female students and 83.72% of male students, with no significant gender difference (P-value = 0.425).

As for dietary factors, 44.64% of female students and 27.90% of male students were aware of the risk associated with high consumption of red meat, but the difference in awareness was non-significant (P-value = 0.168). Meanwhile, overweight and obesity were acknowledged as risk factors by 75% of female students and 86.04% of male students, with no significant gender difference (P-value = 0.384). Additionally, age above 40 was recognized as a risk factor by 80.35% of female students and 86.04% of male students, and the difference in awareness between genders was not significant (P-value = 0.394) (Table 2).

This insightful research sheds light on the awareness levels of breast cancer risk factors among medical students, highlighting areas where knowledge can be improved and dispelling misconceptions. With increased awareness, students are better equipped to make informed decisions and promote breast cancer prevention and early detection in the future.

Discussion

The study looked into several breast cancer risk factors, including using oral contraceptives for more than five years and hormone replacement therapy after menopause. Unexpectedly, a sizable percentage of students—female (80.35%) and male (83.72%)—reported using oral contraceptives for longer periods as a risk factor for breast cancer, however, there was no statistically significant difference in awareness between the sexes. The great majority of students, regardless of gender, knew that hormone treatment was used after menopause (87.50% of female students and 86.04% of male students). It's significant to notice that certain of the study participants' awareness levels diverge from those reported in other research studies. For instance, compared to data from Nepal, the research participants showed a substantially stronger understanding of the association between long-term oral contraceptive usage and breast cancer risk.¹⁶ In addition, the current study and studies carried out in Nepal revealed considerable discrepancies in the knowledge of the risk of breast cancer linked with starting periods before puberty.

Notably, there were some gender differences in awareness of specific risk factors. For instance, a higher percentage of female students (60.71%) compared to male students (37.20%) reported awareness of starting menstruation before the age of 12 as a risk factor, and this difference was statistically significant. This finding was congruent with research conducted among other medical students, as in University of Bisha, Saudi Arabia, where 25.7 % of participants held the notion that menstruating before puberty increased the risk of acquiring breast cancer.¹⁷

The students had a high degree of awareness regarding family history of breast cancer. With no discernible gender difference, both male (90.62%) and female (90.69%) students were knowledgeable about these risk factors. Women with a family history of breast cancer had a thorough understanding of the aetiology and course of the disease, according to studies from Turkey (54.8%) and China (63.6%).^{18, 19} Moreover, female university students from Uganda (48.5%) and Nigeria (46.4%) were found to have good knowledge. This knowledge is crucial since a strong risk factor for breast cancer in the family.^{20, 21}

Breast cancer is most common in women over the age of 50, as has been well-documented.³ On the other hand, 82.82% per cent of the students in this study were aware of this potential danger. Contrastingly, 25 % Female students of Makerere University in Uganda reported to be aware of this.²⁰ Our study showed a higher awareness level in the students, this difference might be because the study conducted in Uganda included medical students

from all 5 academic years and our study included the students only from the final year of medical school which have higher knowledge than the students from earlier academic years.

According to the study's findings, a large percentage of students (92.92%) are aware of the link between excessive radiation exposure during childhood or adolescence and a higher risk of breast cancer. This finding is consistent with the findings of a related study carried out at Makerere University Uganda, which also showed that students were more aware of the connection between high radiation exposure and an increased risk of breast cancer.²⁰

Additionally, according to research Female students at the University of Central Punjab in Lahore have a limited understanding of breast cancer risk factors and symptoms, our study's participants were more aware of breastfeeding as a preventive factor against breast cancer.²² According to research from the Punjab Institute of Nuclear Medicine (PINUM) Cancer Center in Faisalabad, Punjab, Pakistan, 60.8% of women may be at an elevated risk of developing breast cancer if they do not breastfeed.²³

There were no discernible gender differences in knowledge of late menopause, childbearing inexperience, giving birth beyond the age of 30, high dietary fat intake, poor intake of fruits and vegetables, stress, being overweight, or obesity as risk factors for breast cancer. In our study, medical students' knowledge of risk factors such as an excessive diet of red meat, poor consumption of fruits and vegetables, inactivity, and beginning menstruation before age 12 revealed a very low level of awareness, highlighting the need for further instruction on these possible dangers.

The study also looked at the connection between drinking alcohol and the risk of breast cancer. Although studies suggest that alcohol use among women of all ages contributes to 5% to 11% of breast cancer incidences, a sizable portion of students in the current study (86.86%) identified alcohol use as a breast cancer risk factor.²⁴ Importantly, a prior study revealed that 21% of women in their 20s who attended college thought drinking alcohol increased their risk of breast cancer.¹⁴

Hence the awareness level in the students of HITEC IMS was higher as compared to other international studies but still the results highlight the need for further education on potential risks associated with early menstruation. Overall, this study offers insightful information on medical students at HITEC IMS, Taxila Cantt's understanding of breast cancer risk factors. The study shows knowledge gaps and potential areas for focused

educational efforts to raise awareness. Future improvements in healthcare outcomes and early identification of breast cancer may result from providing medical students with correct and current information about the disease's risk factors. Future studies might concentrate on comprehending the underlying causes of the observed gender disparities in awareness and investigate practical ways to improve medical students and the general public's knowledge of breast cancer risk factors.

Conclusion

Most students demonstrated a better understanding of risk factors including using oral contraceptives for more than five years, getting hormone therapy after menopause, being exposed to high radiation levels as adolescents or children, and having a family history of breast cancer. The necessity for targeted educational interventions is indicated by the fact that there are considerable gender disparities in awareness of menstruation before the age of 12.

The association between late menopause, giving birth after the age of 30, lack of previous childbirth experience, low levels of physical activity, a high intake of fatty foods, a low intake of vegetables and fruits, stress, a high intake of red meat, and alcohol consumption are just a few examples of areas where knowledge could be improved despite the overall high awareness levels.

Recommendations

Students can benefit from further education and campaigns to raise awareness of these particular risk factors by arming them with the knowledge they need to advocate for breast cancer early detection and prevention.

Limitations

The study was carried out at a single institution, the results may not be generalizable to other groups. More representative findings could arise from including students from other medical schools or geographically varied areas.

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A Cross-sectional Study of Anemia Among Medical Students and its Impact on Learning, Physical and Emotional Well-being

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Abstract

Objective: To measure the prevalence of anemia and its effect on physical activity, learning skills and social, emotional impact in medical students.

Background: Anemia is a general health issue which severely affects young adults during an intense growth period. The vast nature of medical curriculum demands hard efforts and hectic study schedule medical students at risk of anemia due to irregular eating habits which affects their learning skills and physical activity.

Methodology: A cross-sectional study was conducted among medical students (1st year and 2nd year) of Hazrat Bari Sarkar (HBS) Medical College, Islamabad, by administering a structured questionnaire. This was a year study from August 2023 to July 2024. Data was collected using a structured questionnaire, along with venous blood samples. An automated hematology analyzer located in the Department of Pathology was used to measure hemoglobin. Data Analysis was performed by appropriate statistical tests, and statistical significance was set at P-values <0.05.

Conclusion: More than half the students in our medical school were anemic and had a negative impact on their learning, physical and social well-being. This could possibly be due to their poor eating habits. The memory and academic performance of students can be improved by correction of anemia.

Keywords: Anemia, Hemoglobin, Iron Deficiency, Medical Students, Physical Activity.

Conflict of Interest: None

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Introduction

Anemia worldwide, is mostly due to iron deficiency, seen as microcytic and hypochromic red cells in a peripheral smear.¹ Anemia is a general health issue for almost all groups of ages but severely affects young people mostly in the second decade of life during an intense growth period.^{2,3,4} The condition leads to impaired energy levels, impaired body immune system, increased disease conditions, especially during pregnancy as well in children. As a risk factor, the low socioeconomic conditions can lead to nutritional anemia in all ages. but specifically among small children. Worldwide the incidence is reported at 24.8% (of world

population) with high prevalence in females and preschool children.³

The iron deficiency anemia leads to chronic fatigue, diminished well-being, and impaired cognitive function.⁴ The incidence is increased among young adults and pregnant women due to increased physiological requirements and reduced iron intake. The other causes may include chronic blood loss and poor absorption from the intestine.⁵ The key etiological factors that are accountable for iron deficiency anemia include age, sex, dietary deficiencies, social class, blood loss through menstrual, and stress.^{6,7}

The current study aims to determine the hemoglobin status in young adult medical undergraduate students of age between 19 to 22 years. This age group is vulnerable in both genders for dietary deficiencies as there is increased physiological need of micronutrients including iron. We also elucidate the association of anemia with BMI.

Methodology

Study design, setting and sampling strategy

This is a simple cross-sectional study conducted by a questionnaire, administered to undergraduate medical students of MBBS 1st and MBBS 2nd year male, and female students of HBS Medical College from August 2023 to September 2024. The approval to conduct this study was obtained from the institutional ethical board (IREB HBS Medical and Dental College Islamabad). All undergraduate medical students of MBBS 1st year and MBBS 2nd year students were recruited after obtaining their informed written consent. A sample size of 70 was chosen for this investigation based on a computation made with Epi Info™ Version 7. A reduced sample size was selected to comply with the logistical and practical limitations of the study, even though the optimal sample size calculated was 158 by utilizing a 95% confidence level and 5% margin of error. The choice was selected with the resources at hand, time restrictions in mind, and the simplicity of fitting the research into the academic calendar in mind. We made sure the sample remained typical of the population by using simple random sampling throughout the lectures, so even with a smaller sample size, the validity of our findings was maintained.

Data and sample collection

Demographic and other relevant data were collected using a pre-designed questionnaire. Then, about 3ml of venous blood was obtained from the same students by venipuncture into an EDTA tube under aseptic conditions. The Hemoglobin level was measured using automated analyser in Department of pathology, HBS Medical Hospital, Islamabad).

Estimation of Hemoglobin (Hb)

Hemoglobin (Hb) concentration was measured using Hematology Analyzer, model Sysmex XP-100 (Sysmex Corporation, Kobe, Japan)." at the Laboratory of HBS Medical Hospital, Islamabad. If the Hb concentration was less than the cut-off points recommended by the World Health Organization (WHO); namely, 13.0 g/dL for adult males and 12.0 g/dL for adult non-pregnant females, the subject was labelled as anemic.

Statistical Methods

To analyze research data IBM SPSS v.20 was used. The data of 70 participants (20 males and 50 female students of (MBBS^{1st} year and MBBS^{2nd} year) were analyzed by descriptive and inferential statistics. The symptoms were compared with gender, age and hostel/day scholar status of participants. Significance (p-value) was measure for each statement in males and females. To compare the symptoms with gender, chi-square test was performed. Statistical significance was considered at P-value < 0.05.

Results

Participant Characteristics

Based on hemoglobin levels we classified the enrolled medical students into anemic and control (normal) groups. The anemic and controls were further classified on the basis of age between 19 years to 22 years. To answer the question of whether anemia is common in day scholars or hostel students we also divided all the participants into hostlers and days Scholars.

Factors associated with Anemia

A detailed questionnaire was constructed to investigate the effects of anemia such as general health, psychological well-being, physical effects and the anemia impact on academic performance. To have such information we designed total of fourteen questions and calculated the p-value to have a significance level (Table 2).

Prevalence of anemia in medical students:

Shows that anemia was prevalent among 45(64.28%) out of 70 students medical students. Out of 45 anemic students, 32 were female and 13 were male anemic students. Among anemic's maximum number (n=20) belong to the 19-year-old of age group. Analysis of all the information are provided in Table 2.

Demographic details:

In the current study, we enrolled a total of 70 medical students including 20 males and 50 females of HBS Medical College Islamabad, as shown in Table (1). Total anemic (males and females) was 45 while non-anemic (control) was 25. All the students belong to the age group between 18 years and 21 years age group. The mean±standard deviation hemoglobin (Hb) concentration for anemic and control students is 10.07±1.02 (g/dl) and 13.72±1.80 (g/dl). Most students n=52 (73 %) of enrolled students were day scholars living with their parents and siblings. Table (1) shows that anemia among medical students at HBS Medical Dental College, Islamabad was not significantly associated with age, gender, and residential status with p-values of 0.9370, 0.1790, and 0.9040 consecutively.

Table 1: Demographic Information.

Factors	Category	Group		Statistical Analysis (<i>p</i> -value)
		Control	Anemic	
Gender	Male	7	13	<i>p</i> > 0.05
	Female	18	32	
Age	18 Years	7	15	<i>p</i> > 0.05
	19 Years	3	20	
	20 Years	9	17	
	21 Years	6	3	
Residential Status	Hostler	7	12	<i>p</i> > 0.05
	Day Scholar	18	33	

Effect of anemia on general health:

The data analysis revealed significant findings in the students with low hemoglobin levels (anemic) suffer more fatigue compared to the control. A further positive correlation is observed in anemic group and physical activity (*P* value 0.00). Anemics suffer from tachycardia during simple physical activity. Another significant correlation (*p* value 0.005) is observed when anemics were asked if they suffer or find it hard to retain information or recall during exams. Interestingly, the anemic group experiences emotional impact as well with

mood swings significantly higher than a control group with a significant value (*p*-value 0.002). We hypothesized that anemics need more breaks or rest periods during study because that overly exhaust in routine activity. No correlations were observed in all these questions (Table 2). We further noticed that anemia does not affect students' fatigue or low energy during the study, their academic performance, and interest in classroom discussions.

Statement	Response Type	Group		<i>P</i> -value
		Control	Anemic	
Have you been experiencing fatigue or Weakness during the day?	No	14	9	<i>p</i> < 0.05
	Yes	9	17	
	Sometimes	2	19	
Do you require more breaks or rest periods during study sessions?	No	9	15	<i>p</i> < 0.05
	Yes	16	20	
	Sometimes	0	10	
Do you find it harder to retain information or recall it during exams?	No	14	21	<i>p</i> < 0.05
	Yes	11	10	
	Sometimes	0	14	
Do you experience shortness of breath or rapid heart rate during physical activities?	No	14	5	<i>p</i> < 0.05
	Yes	11	10	

	Sometimes	0	30	
Are you able to complete routine tasks without feeling overly exhausted?	No	9	5	<i>p</i> < 0.05
	Yes	16	19	
	Sometimes	0	21	
Has anemia affected your ability to work, study, or engage in hobbies?	No	12	11	<i>p</i> < 0.05
	Yes	4	8	
	Sometimes	9	1	
Have you experienced or going through any social or emotional impact?	No	18	4	<i>p</i> < 0.05
	Yes	7	14	
	Sometimes	0	2	
Do you need assistance or modification to carry out tasks that required physical exertion?	No	20	26	<i>p</i> > 0.05
	Yes	2	4	
	Sometimes	3	15	
Do you engage in regular physical activity. Kindly mentioned you work out duration daily.	No	12	11	<i>p</i> > 0.05
	Yes	7	4	
	Sometimes	6	14	
Have you experienced or going through any social or emotional problem?	No	12	10	<i>p</i> > 0.05
	Yes	13	10	
Do you experience fatigue or low energy during class or while studying	No	10	11	<i>p</i> > 0.05
	Yes	15	27	
	Sometimes	0	7	
Have you noticed any changes in your academic performance, such as a decrease in grades or difficulty concentrating?	No	14	3	<i>p</i> > 0.05
	Yes	5	4	
	Sometimes	6	3	

Discussion

Anemia is regarded as a public health condition that impacts both developed and developing countries. It not only affects human physical health but also social and economic life.^{2,3,8} In an earlier study from Pakistan it is reported that 29.6% of non-pregnant and 36.5% of pregnant females suffer from anemia. Another study conducted on students from a remote area of Pakistan revealed that 58.8% of males and 70.0% of females were anemic.⁹ The school-going age in males, as well as

females, is an important period of physical and mental growth and also a key period for acquiring new knowledge. Prolonged iron deficiency diet or poor bioavailability and requirement of iron rich diet during development and pregnancy are main factors. The iron losses resulting from excessive menstruation and worm infestations can also contribute to anemia.¹⁰

School-going age is very important age in terms of physical and mental growth, development and acquiring new knowledge. It can lead to irreversible learning loss for young students specifically 10–14 year age group and a primary cause of loss of disability-adjusted life.¹¹

In this questionnaire-based study in medical students, we intended to estimate the prevalence of anemia and its effect on student learning, and physical and cognitive health. According to demographic data greater number of participants in the current study revealed mild or severe anemia (68.28%). Morphologically it appeared to be microcytic hypochromic anemia probably due to an iron deficiency diet. Similar findings were reported by Pandey S and colleagues.¹² We further observed that the occurrence of anemia is higher in females (n=32) compared to males (n=13). These findings are similar to those reported earlier in an Indian study.¹³

Furthermore, our results extend previously reported findings regarding depression and physical activity among anemic.¹⁶ We also observed less and short physical activity (p -value 0.002) or shortness of breath or mild tachycardia ($p=0.001$) and social or emotional impact ($p=0.002$). We also found a positive correlation when estimating students who feel overly exhausted in routine physical tasks ($p=0.01$). In the current we observed no correlation between anemia and classroom study-related tasks or mental exertion ($p=0.13$) or whether students suffer fatigue or low energy while studying ($p=0.07$). These results also supported by a recent study.¹⁴

Clinicians should recommend more physical activity, for any acceptable duration to patients with depression and anemia. Large demographic studies are required to stratify depression and anemia by severity in our population.

It is suggested that health professionals should recommend Iron iron-rich diet and mild physical activity for a shorter duration of time to improve the physical activity among anemic. Further study is needed to stratify depression or social issues due to anemia in a larger cohort. Our study has a few limitations such as due to a low study sample we cannot recommend physical activity, and also could not exclude the potential effect of a recent pandemic. We used self-reported answers to questionnaires to quantify physical activity rather than using objective accelerometer recordings, which is also one limitation to our study. Also, subjective recall of physical activity variance by anemia status, cannot be clarified. Studies in a large cohort with exact hemoglobin levels among females and males, calculated type and time of physical activity, the exact type of social and mental conditions, and participation in the level of classroom activity can produce more dependable and quality results.

Conclusion

More than half of the students in our medical school were anemic and had a negative impact on their learning, physical and social well-being. Possibly Due to vast curriculum and hectic study routine, the medical students follow irregular eating habits and consume junk foods. There is a dire need for creating awareness of eating a healthy diet and adopting a healthy lifestyle. Treatment of anemia could significantly improve the memory and academic performance of students.

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^{1,6}Substantial contributions to the conception or design of the work;

^{2,3,4,5}the acquisition, analysis, or interpretation of data for the work & Final approval of the version to be published

^{1,5,6} Drafting the work or revising it critically for important intellectual content.

Extended Drug Resistant Typhoid Fever; A Case Report

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Abstract

Enteric fever is a potentially fatal multisystem illness caused primarily by *Salmonella typhi* and, to a lesser extent, by Para typhi A, B, and C. Decades of indiscriminate usage of Antibiotics has led to emergence of multiple resistant strains. Multi drug resistant strains against *Salmonella typhi* has made treatment options limited and costly.

According to WHO an estimated 11–20 million people get sick from typhoid all over the world. In the year 2022 an outbreak of Enteric fever emerged in April and spread all over Pakistan. This created a great concern as the causative organism were mostly Multi drug resistant. We recently have documented a case of extended drug resistant (XDR) Enteric Fever with a complicated clinical course, responding only to Carbapenem (Meropenem/Imipenem). The purpose of reporting this case was to highlight the morbidity, cost and therapeutic challenges which are associated with severe XDR *S. typhi* infection in Pakistan.

Keywords: Typhoid, COVID-19, Water Sanitation, Healthcare, Vaccine, Pakistan.

Conflict of Interest: None

Funding Source: None

Introduction

Typhoid fever, or enteric fever is a potentially fatal multisystem infection produced primarily by *Salmonella enterica* serotype *typhi* and to a lesser extent *S. enterica* serotypes and paratyphi A, B, and C.¹ *Salmonella* are motile enterobacteriaceae that can produce a variety of gastrointestinal infections.² It presents in a wide variety of ways ranging from an overwhelming septic illness to minor cases of diarrhea with low-grade fever.³ It spreads through feco-oral route. Contamination of food usually occurs due to poor sanitation and sewerage water being mixed with drinking water.^{1,2} Incubation period depends upon inoculum size and host factor ranging from 3-60 days with an average of 8-14 days.⁶

Case Presentation

A 24 year male, resident of Islamabad, presented to Medical OPD on 6th May, 2022 with complaints of fever, nausea and vomiting for 2 weeks. Patient was in his usual state of health until 2 weeks before admission when he developed fever which was high grade,

documented up to 104 °F, intermittent, associated with rigors, chills, loose stools, nausea and vomiting. There was no H/O abdominal pain, cough or urinary symptoms. He denied any history of skin rash and recent travel. He was advised Cefpodoxime (3rd Generation Cephalosporin) 100 mg BD per oral for 5 days in OPD at another hospital. Loose stools settled after 3 days, however, even after 5 days of antibiotics, he remained febrile. He was also prescribed antimalarials for three days (Artemether/Lumefantrine) without any benefit.

He was a doctor by profession and resided in a hospital hostel. He has no pre morbidities and his family history was insignificant.

On Examination his vital signs were; pulse 100 beats/min, B.P = 120/80 mmHg, Temp 102 °F, Respiratory rate 20/min and oxygen saturation was 97 % on room air. On GPE, no lymphadenopathy, jaundice or pallor was present. Abdominal examination showed soft, non-tender abdomen with mild splenomegaly, shifting dullness was absent. The rest of the systemic examination was unremarkable. His investigations were

as follows (Table 1):

Lab Investigations	Follow-up (Dates)					
	9/5/2022	6/5/2022	4/5/2022	3/5/2022	1/5/2022	29/4/22
TLC	10.6	6.5	7.1	5	6.9	7.2
Hb	11.8	13.8	12.8	12.3	14.8	16.2
Platelets	336	228	131	107	145	341
Neutrophils (%)	80	70	63	62	70	68
Lymphocytes (%)	18	25	30	31	22	22
ALT	71	58	-	-	-	-
CRP	76.6	-	-	-	-	-

His serum creatinine, urine R/E and CXR were with normal range. His MP smear and dengue serology were negative. Ultrasound was normal except a mild splenomegaly.

Patient was admitted in ward with working diagnosis of suspected Enteric Fever and was started on I/V Ceftriaxone 1 gram BD and oral Azithromycin 500 mg OD. Blood C/S report received on 2nd day of admission which showed no growth. Another sample of blood was taken and sent for culture and sensitivity. However, the patient continued to spike fever as shown in the graph below.

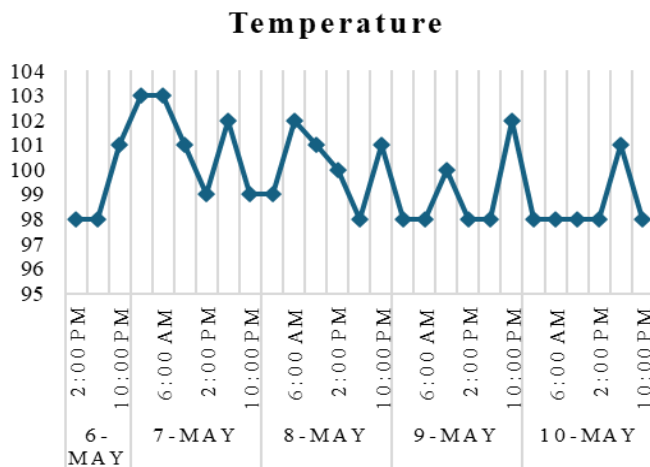


Figure 1: Pattern of patient rise in temperature (fever)

Extensively Drug Resistant (XDR) Enteric Fever was suspected on fourth day due to poor drug response. Hence patient was started on IV Meropenem at the dose of 1-gram IV TDS. IV ceftriaxone and oral Azithromycin were discontinued. On 6th day of admission, Blood C/S report was received which showed growth of *Salmonella Typhi* (XDR strain) sensitive only to Carbapenems (Meropenem/Imipenem) (Table 2).

His condition improved after Meropenem and frequency of fever spikes decreased. After 3 days he was afebrile. Meropenem was continued for a week during his hospital stay. Patient was discharged and was advised IV Meropenem for further week. Follow up showed complete recovery.

Antibiotic	Results	Antibiotic	Results
Amoxicillin / Clavulanic Acid (Augmentin)	R	Ampicillin	R
Azythromycin (Azythrocin)	R	Chloramphenicol	R
Ciprofloxacin (Ciproxin)	R	Co-trimazole (Septran)	R
Imipenem	S	Piperacillin-Tazobactan (Tazocin)	R

*S – Sensitive, *R – Resistance

Discussion

According to WHO classification of Enteric fever non-resistant cases are those who are sensitive to first line drugs (amoxicillin / ampicillin, co trimoxazole and chloramphenicol) and 3rd generation cephalosporin with and without resistance to second line drugs.⁶ Multi drug resistant are those who are resistant to first line drugs with and without resistance of second line drugs. Extended drug resistance are those who are resistant to all recommended antibiotics of typhoid.

The outbreak of Multi drug Resistant typhoid (XDR *S.*) in Pakistan have become an alarming public health

concern. National Institute of Health (NIH) Islamabad reported a total of 14,360 XDR-TF from January 2017 till June 2021 in Karachi alone, and from November 2016 to June 2021, a total of 5,741 confirmed cases of XDR-TF in all districts of Sindh province (excluding Karachi), while 69.5% cases were reported from District Hyderabad.⁵

Pakistan has been in an ongoing struggle against XDR-TF for almost 5 years now and this year also many cases have been reported. Our patient was also a suspected case of enteric fever and he did not respond to first line drugs with resistance for azithromycin. His first culture turned out to be negative, taken at the first week of illness when patient was already taking 1st generation cephalosporin. The second culture was sent at the start of second week after stopping antibiotics for 48 hours confirmed *Salmonella Typhi* resistant to all first and second line drugs, with sensitivity only to carbapenem alone. He responded well to carbapenem IV and his fever settled after 3 days dose. He was advised to complete injectable treatment for 14 days to prevent recurrence and carrier state.

Our patient had XDR *S. typhi* strain that was resistant to five classes of antibiotics, i.e. chloramphenicol, ampicillin, trimethoprim-sulfamethoxazole, fluoroquinolones, and third-generation cephalosporin.⁴ He was also resistant to Azithromycin which is usually reserved for resistant cases only. Since COVID 19 infection, the health care professionals are frequently prescribing Azithromycin for patients with symptoms of upper respiratory tract infections. This could be one of the factors for the emergence of resistance against azithromycin and also adds up to the cases of XDR

Typhoid. This calls for adoption of a rational and evidence-based approach to prescribe Azithromycin in COVID infections.

Conclusion

Enteric fever is highly prevalent in Pakistan, and we should keep it in differential diagnosis of acute febrile syndromes. Despite of worldwide surveillance and improved diagnostic efforts, the diagnosis of Enteric fever by laboratory and clinical examination has low sensitivity so blood and stool cultures should be taken properly for accurate diagnosis.

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^{1,4,6}Substantial contributions to the conception or design of the work;

^{2,3,4,5}the acquisition, analysis, or interpretation of data for the work & Final approval of the version to be published

^{1,5,6} Drafting the work or revising it critically for important intellectual content.

Twin Pregnancy Coexisting with Partial Mole and Normal Fetus: A Case Report

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Abstract

This case report highlights the rare occurrence of a twin pregnancy coexisting with a partial mole, presenting a unique set of challenges in management and outcome. A 20-year-old woman with primary subfertility conceived twins following ovulation induction, experiencing hyperemesis gravidarum and subsequently developing severe pre-eclampsia. Despite efforts to control her condition, termination of the pregnancy was necessary due to maternal safety concerns. Both twins, without anomalies, succumbed to early neonatal death. Histopathological examination revealed a partial mole. The case emphasizes the importance of vigilant monitoring and individualized treatment in such complex pregnancies, with a focus on maternal well-being. Continued follow-up is crucial to detect and manage potential gestational trophoblastic disease. This report underscores the need for informed decision-making and patient-centered care in managing twin pregnancies coexisting with molar tissue.

Keywords: Partial Mole, Fetus, Twin Pregnancy.

Conflict of Interest: None

Funding Source: None

Background

Co-existence of partial mole and twin pregnancy occurs rarely. If it occurs it is usually associated with complications like fetal anomalies, hyperemesis gravidarum, severe pre-eclampsia and termination of pregnancy. Partial mole and its association with twin pregnancy with normal fetuses is also a quite rare form of gestational trophoblastic but unfortunately associated increased risk of obstetric complications and poor perinatal outcome.

Case Presentation

A 20 year lady, married for 4 years with primary subfertility had her ovulation induction at our center. She conceived after induction with twin pregnancy.

In first trimester she developed hyperemesis gravidarum and was admitted twice. In early second trimester she became hypertensive and at twenty weeks of pregnancy showed features of severe pre-eclampsia. Her ALT was 72, with 24 hours urinary proteins 1190 mg/24 hours. The ultrasound at this stage showed normally growing

twin fetuses.

At around 24 weeks her blood pressure was 170/100, abdominal examination showed her symphysio-fundal height at 30cm. She had bilateral pitting pedal edema along with oedema of anterior abdominal wall. Ultrasound showed both twins, alive along with enlarged ovaries.

After admission anti-hypertensive medication was started but despite higher doses, her pressure remained uncontrolled. Subsequently her labs were further deranged and patient become symptomatic with headache, blurring of vision and epigastric pain.

For safety of mother the termination of pregnancy was planned at 26 weeks of gestation as recommended by guidelines. Medical termination done with misoprostol according to FIGO protocol and she delivered both twins with cephalic presentation. Placenta and membranes were delivered manually. Placenta was very unhealthy looking and has some cystic lesions on it, so it was planned to send placenta for histopathology. Both twins were male with of 800gm and 850 gm. and were without

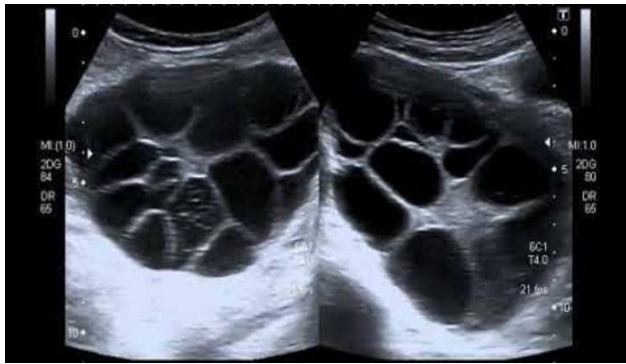
visible structural anomalies. They were kept in NICU but ended up in early neonatal death within 24 hours. Autopsy was not done but no visible structural abnormality noted in both twins.

The histopathology report of placenta showed partial mole with dilated chorionic villi along with focal trophoblastic proliferation with no features of malignancy.

At the time of discharge her beta HCG was done which was 4500 IU and USG showed bilateral theca luteal cysts. She was put on follow up for BHCG and USG.

It took 8 months for BHCG to become less than 5 IU and 6 months for disappearance of theca luteal cysts.

But during these 8 months she had unscheduled bleeding for 5 months



Discussion

Partial molar pregnancy results from fertilization of normal ovum by two sperms giving rise to triploid karyotype that is 69 XX. Three types of molar pregnancy occur with normal fetus that is twin pregnancy with one normal baby and normal placenta and another complete mole, the second type is twin pregnancy with normal fetus and placenta and other with partial mole and the third one which is uncommon is normal fetus with partial molar pregnancy.

Ultrasound is the main tool used for diagnosis of molar pregnancy in antenatal time period, but in our case ultrasound does not reveal any abnormality during antenatal time period. Patients' early presentation was severe preeclampsia that was the alarming sign later on bilateral theca luteal cysts were identified. Molar was confirmed in our case after histopathology of placenta that it is a partial mole.

Partial mole coexisting with alive fetus occurs rarely. Normal looking placenta with normal fetus can be associated with either partial mole or complete mole. The

risk factors for such type of pregnancies are previous molar pregnancy or occurs at extreme of ages 1,2.

All types of molar pregnancies are usually associated with fetal anomalies and maternal complications.^{3,4} The incidence is around 0.005% - 0.01% of all pregnancies.⁵

A same case was reported in department of obstetrics and gynae Madda Galabu university Ethiopia. She was 40 years old G13P10a2 at 28 weeks. She was a case of twin pregnancy and pre-eclampsia with headache, bilateral pedal edema and epigastric pain with reduced fetal movement on examination fundal height was larger than dates and BP was raised. Her USG showed honey combing in placenta. Her BP was controlled and delivered a male child of 1400 gm with ENND and histopathology confirmed partial mole.⁶

In our case we had partial mole with normal twins same such a case report of 32 years old G3P2 presented at 22 weeks with uterine contractions in hospital of southern medical university she delivered a live normal baby with molar pregnancy.⁷

Twin or triplet pregnancies have greater risk of pre-eclampsia, preterm labor and poor neonatal outcome. In our case patient had hyperemesis gravidarum with early onset of PIH and later on developed severe PE which was confused with twin pregnancy, but it's actually amplified due to presence of molar tissue which was diagnosed after termination of pregnancy.

Initial modality which is considered as best screening and diagnostic tool is beta HCG. It has higher detection rate if done in early second trimester (.43%-68%)⁶. Histopathological findings truly differentiate between partial and complete mole.¹

Treatment plans vary from patient to patient and is based on time of diagnosis. When diagnosed earlier option are discussed with couple. Most of these pregnancies arises from infertility treatment (as in our case). So most of women wanted to continue the pregnancy despite the risks. But when diagnosed in later part of pregnancy it's hard to decide to continue the pregnancy or terminate it. Continuation of pregnancy with strict fetomaternal monitoring⁸. Best mode of delivery is via C section to minimize risk of metastasis^{9,10}.

Due to risk of progression of disease strict follow up plan should be made because there is a possibility that it persists as GTD. Patients with complete mole should be followed for 6-12 months after normalization of beta

HCG and patient with partial hydatidiform mole should be followed for 4 weeks after normalization of beta HCG.

Conclusion

Grave maternal complications are associated with twin pregnancy and molar pregnancy, so maternal safety should be prioritized. If patient wants to continue the pregnancy she should be booked in tertiary care setting. Termination should be planned if it's associated with fetal anomalies or worsening of maternal condition.

Consent

Informed consent is obtained from the patient before publication.

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^{2,3,4,5}the acquisition, analysis, or interpretation of data for the work & Final approval of the version to be published

^{1,2} Drafting the work or revising it critically for important intellectual content.

Development of Competency Profile for Doctoral Candidates in Diagnostic Healthcare Fields: A Scoping Review

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Abstract

Background: Competency frameworks play a crucial role in guiding the education and training of doctoral candidates in diagnostic healthcare Fields. This scoping review aims to systematically map the existing literature on the development of competency frameworks and competency profiles tailored for doctoral-level education in diagnostic healthcare professions, particularly Pathology.

Methodology: The Arksey and O'Malley framework was applied to undertake this scoping review. A comprehensive search strategy was developed using a combination of medical subject headings (MeSH) terms and keywords related to competency frameworks, clinical competence, professional competence, diagnostic healthcare profession, doctoral education, and synonyms. Electronic databases such as PubMed, Scopus and Web of Science were searched, along with targeted searches of grey literature sources like Google scholar. We screened studies for inclusion by title and abstract, and we included studies of any type that described the development of a competency profile/framework for doctoral candidates in a Diagnostic healthcare profession. Data compilation was qualitative.

Results: The total records identified from the databases were n=204,351. Out of these the records removed before screening were Duplicate records removed (n =137,300). Records marked as ineligible by automation tools (n =51030), Records removed for other reasons (n =12,521). Records screened were n=3500. Based on the exclusion criteria n=3253 records were excluded. Reports which could not be retrieved were n=122. Finally, n=135 reports were assessing for eligibility and out of these n=71 were excluded from Allied Health Sciences and n=64 were excluded because they focused primarily on competencies of Nursing students. Finally, n=21 studies were included in the scoping review and the findings were charted.

Conclusion: We observed significant variation within the conduct and reporting of the competency framework development process. While some variation can be expected given the differences across and within medical professions, our results suggest there is some difficulty in determining whether methods were fit-for-purpose, and therefore in making determinations regarding the appropriateness of the development process. This uncertainty may unwillingly create and legitimize uncertain or artificial outcomes. There is a need for improved guidance in the process for developing and reporting competency frameworks.

Keywords: Diagnosis Strategies, Healthcare, Pathology.

Conflict of Interest: None

Funding Source: None

Introduction

Competence profiles outline the essential knowledge, skills, and attributes required for proficient practice in diagnostic health sciences, particularly Pathology. By identifying these competencies, educators can design and deliver high-quality doctoral programs that adequately prepare candidates for their roles in the field.¹ Competence profiles help align doctoral education with

professional standards and regulatory requirements. They ensure that doctoral candidates acquire the necessary competencies to meet the expectations of accrediting bodies, licensing boards, and professional organizations.

Diagnostic health sciences play a critical role in patient care and safety. Competence profiles guide doctoral candidates in developing the skills needed to perform accurate diagnoses, interpret results, and communicate effectively with patients and healthcare teams, thereby

enhancing the quality and safety of healthcare delivery.² Competence profiles often encompass interdisciplinary skills, fostering collaboration among healthcare professionals from different specialties.

By identifying common competencies across disciplines, doctoral programs can facilitate interprofessional education and teamwork, leading to improved patient outcomes and holistic care. Competence profiles serve as a foundation for lifelong learning and professional development. They provide doctoral candidates with a roadmap for continuous skill development and self-assessment throughout their careers, enabling them to stay abreast of advances in diagnostic technologies, evidence-based practices, and ethical standards. Clear competence profiles can facilitate career advancement and mobility for doctoral candidates in diagnostic health sciences.

By demonstrating mastery of essential competencies, candidates can enhance their employability, pursue advanced roles or specialties, and transition seamlessly between different healthcare settings or geographic locations.³ Competence profiles can also inform research agendas and drive innovation in diagnostic health sciences. By identifying emerging competencies related to new technologies, methodologies, or healthcare trends, doctoral programs can prepare candidates to contribute to cutting-edge research, develop novel diagnostic tools, and address evolving healthcare challenges. Competence profiles promote accountability and transparency in doctoral education. They provide stakeholders, including students, faculty, employers, and the public, with clear expectations regarding the knowledge, skills, and behaviors that doctoral candidates should possess upon completion of their programs, thereby fostering trust and confidence in the healthcare workforce.⁴

Supervisors in diagnostic pathology typically possess extensive expertise and experience in the field. Their firsthand knowledge of the profession, including its evolving practices, technological advancements, and regulatory requirements, allows them to provide valuable insights into the competencies required for doctoral candidates to succeed in the discipline. Supervisors are actively engaged in the practice of diagnostic pathology, often serving as practicing pathologists themselves. Their perspectives are closely aligned with the realities of clinical practice, laboratory operations, and professional standards, ensuring that competence profiles accurately reflect the skills and knowledge needed for effective performance in the field. Supervisors play a central role in shaping the professional development of doctoral candidates in diagnostic pathology.⁵ Through mentorship, guidance, and feedback, they help candidates acquire and refine the competencies outlined in the profiles, fostering their growth as competent and

ethical practitioners. Supervisors' input into competence profiles ensures that doctoral training programs support candidates' holistic development as future pathologists.

Diagnostic pathology is a dynamic field influenced by scientific advances, technological innovations, and evolving healthcare trends. Supervisors' perspectives enable competence profiles to adapt to these changing needs over time, ensuring that doctoral training remains responsive to emerging challenges and opportunities in the discipline.

Hence, aim of the study is identifying competence profiles for doctoral candidates in diagnostic health sciences particularly Pathology through scoping review of literature that are essential for promoting excellence in education, enhancing patient care and safety, fostering collaboration and innovation, and ensuring the continued advancement of the healthcare profession.

Methods

A comprehensive search strategy was developed using a combination of medical subject headings (MeSH) terms and keywords related to competency frameworks, clinical competence, professional competence, diagnostic healthcare professions (e.g. pathology), doctoral education, and synonyms. Electronic databases such as PubMed, Scopus and Web of Science were searched, along with targeted searches of grey literature sources like Google scholar.

The five stages of Arksey and O'Malley's (2005) framework were applied, comprising:

1. determining the research question
2. locating pertinent studies.
3. improving the parameters for study selection,
4. gathering pertinent information from every article, and
5. gathering, compiling, analyzing, and reporting the data

Results were presented in accordance with Annexe 1 of the PRISMA Extension for Scoping Reviews. After the citations were manually eliminated from EndNote X8 (Clarivate Analytics, Philadelphia, PA), they were imported.

Research Questions

What are the essential competencies that a PhD student in Diagnostic Pathology should possess upon completion of his training to succeed as a teacher, researcher and clinician?'

Finding Relevant Studies: Research that created a competency framework or competency profile for doctorate candidates in the health sciences, or that entailed a PhD in a healthcare profession, was eligible for inclusion. Included were studies that provided explicit descriptions of the development process and the supervisors' or teachers' perspectives on doctoral training in health sciences and diagnostics, particularly pathology. We only included the version of the data that gave the most complete information when the same data were published in multiple publications (such as a thesis and a journal article). Included were reviews, original publications, whole texts, meta-analyses, and critical reviews.

Refining The Study Selection Criteria: Studies more than 8 years old, articles in language other than English, articles where full text was not available, articles lacking a competency framework, competency profile, conference proceedings, those with unclear methodology, books, associated data and duplicate articles were excluded.⁶

Charting the Data

Charting the data for a scoping review was done by organizing and summarizing relevant information extracted from the included studies. The charting process typically involved creating a data extraction form or table to systematically capture key details from each

study. This table included a structured overview of the data extracted from each included study, including details such as the study ID, authors, year of publication, title, aim/objective, methodology, sample size, diagnostic specialty, competency components addressed, and key findings/themes identified. This format facilitated the synthesis and analysis of findings across studies during the scoping review process.⁷

Results

The records identified from the databases yielded n=204,351 articles. Records removed before screening were as follows: Duplicate records removed (n =168,300), Records marked as ineligible by automation tools (n =21030),Records removed for other reasons as per the exclusion criteria (n =11,521). The remaining 3500 articles were screened using automation and AI tools and those not fulfilling the specific inclusion criteria, those which could not be retrieved and those pertaining to Allied Health Sciences and Nursing were excluded (Annex-1).

Characteristics of the Studies included:

Sr. No.	Author, Year of publication	Research objective	Study Design	Major findings	Limitations, Gaps	Conclusion & Future research
1	McCloskey et al.,2017	To provide trustworthy professional activities that include primary anatomic and clinical pathology resident training for pathology graduate medical education.	Qualitative, Delphi, Graduate Medical Education Committee of the College of American Pathologists	Nineteen entrustable professional activities were developed, including 7 for anatomic pathology, 4 for clinical pathology, and 8 that apply to both disciplines with 5 of these concerning laboratory management.	The ability of programs to incorporate the idea of EPAs into their particular programs in a way that improves direct observation of resident performance, contributes to resident education, and avoids overly complicating the evaluation process or burdening faculty or program administration is the last obstacle facing the EPA model.	The entrustable professional activities outlined by the Graduate Medical Education Committee are meant to provide an initial framework for the development of entrustable professional activity-related assessment
2		To create and implement an instructional	expert work group of 20 pathologists to identify critical pathology	Work group researched and developed 38 peer-	The addition of new curriculum elements presents practical	It will help to better prepare all pathology residents

		framework and curriculum in pathology informatics that directs pathology residency programs in providing residents with essential knowledge and abilities in pathology informatics.	informatics training outcomes.	reviewed outcome statements identifying the knowledge and skills that all residents should have in pathology informatics to practice pathology upon completion of their residency program.	implementation obstacles, mainly related to faculty expertise and time constraints.	for the modern practice of pathology.
3		A redesigned pathology residency program that satisfies and promotes ongoing changes to the Accreditation Council for Graduate Medical Education and American Board of Pathology standards.	Qualitative, Expert Group	This model is based on five structural components: (1) an advanced credit pathway that involves involving trainees during medical school; (2) a "onboarding" procedure at the beginning of training; (3) a boot camp that converts to a core curriculum that offers foundational training throughout the AP/CP continuum; (4) advanced training modules customized to the trainee's career objectives; and (5) a period of intense and progressive responsibility culminating in independent practice experience. These components all have separate uses.	With the dawn of a new era comes new problems and the need for programs that address seemingly incompatible objectives: improving, expanding, and streamlining training.	Reduce the time to readiness for practice, and produce more effective, interactive, and adaptable pathologists.
4		Report discusses the need for a Doctorate in Clinical Laboratory Sciences program and describes a curriculum to train Doctorate in Clinical Laboratory Sciences students.	The University of Texas Medical Branch (UTMB) in Galveston, Texas, offers a Doctorate in Clinical Laboratory Sciences (DCLS) degree. This program's characteristics and outcomes are the subject of a report and survey-based Quality Improvement/Quality Assurance initiative. An anonymous survey was completed by a total of 28 faculty physicians who oversaw the students during their clinical service rotations. 33	The candidate pool's preadmission accomplishments were higher and the admission rates were lower in the last two admission cycles (2018–2019 and 2019–2020). Following the training, more than half of the graduates took up new jobs. The majority of our graduates have become laboratory directors	A clinical doctoral degree has been created for individuals who obtained nondoctoral degrees in pharmacy	DCLS programs continue to evolve, it will be critical to collect and analyze data to obtain evidence of the full impact of DCLS graduates on patient care.

			DCLS students who had completed more than half of their clinical rotations responded anonymously to a cross-sectional survey.			
5		Explores the lived experiences of biochemistry, microbiology, and pathology residency program directors to better understand how they utilize the CanMEDS competencies.	Study phenomenographic. Semi-structured interviews with eight directors of laboratory medicine programs across Canada were conducted one-on-one, and inductive thematic analysis was used to examine the collected material.	The results demonstrate how the existing framework is out of step with the particulars of laboratory medicine, with certain competences appearing to be unrelatable when compared to the current set of standardized criteria and expectations.	To make it accessible more autonomy is required to adapt the framework	Newer renditions of the CanMEDS Competency Framework should better consider the realities of non-clinical disciplines.
6		The procedure and results of a pilot project that examined whether six pathology residency programs that volunteered for the study could use two anatomic pathology and two clinical pathology EPAs in pathology training.	Pre- and post-study surveys were given to participating residents, faculty, and program directors to gauge baseline practices and to gather feedback on the EPA implementation experience.	Results demonstrated overall good feasibility in implementing EPAs. Faculty acceptance of EPAs varied and was less than that of program directors.	There are still certain obstacles to overcome, such as gaining faculty support and creating an electronic platform with data analytic capabilities and easy access.	The expanded use of EPAs in a way that makes sense for pathology residency, furthering the national goals of competency-based medical education.
7		His article explores the following question: which research competences are being imparted or acquired during medical studies and the doctorate?	Qualitative research project. Information gathered from the N=455 Bavarian Medical Graduate Panel Survey (MediBAP), in which participants evaluated their own research proficiencies. We conducted qualitative interviews with doctorate medical graduates and E-Prom research participants (N=14) in order to aggregate the data.	Quantitative analyses show that medical graduates evaluate the medical curriculum's research contents and their acquired competences as rather low.	The validity of the quantitative data returns is limited as a result of the item formulations. It would be beneficial to comprehend and specify which competencies should be acquired at various stages of medical studies due to the diversity of research competencies.	Such features, as well as the acquisition of research competencies within the ordinary medical curriculum and the PhD phase, should be able to be distinguished in the future.
8		Prom projects looked at the influence of the doctoral phase on the careers of young scientists in the life sciences using the example of doctoral graduates from biological and medical faculties.	Using quantitative techniques, a longitudinal survey of more than one thousand PhD graduates (N = 1796) from North Rhine-Westphalia, Saxony, and Bavaria was conducted at various stages after the degree. Furthermore, two qualitative investigations were carried out to enhance comprehension	Certain advantages of structured doctoral programs over conventional individual doctorates are shown via analysis. The differences between these PhD techniques, however, are not as great as first thought. Overall, there are	Unfortunately, the data do not provide any strong explanatory factors for their disadvantage	This design can already be applied in the doctoral researcher selection process, or it can be useful in the future for monitoring doctoral researchers inside the doctoral process.

			of the doctoral stage and professional entrance, as well as to illuminate the circumstances surrounding advanced postdocs in their future career planning.	significant differences in the actual design of PhD programs.		
9		Aim of the present article was the analysis of research competences among medical graduates with the newly developed Munich Medical Research Competences Scale that was piloted at the medical faculties in Bavaria.	All medical graduates from the medical faculties of FAU Erlangen-Nuremberg, LMU Munich, TU Munich, University of Regensburg, and JMU Würzburg in 2017–18 were targeted by the online survey.	The findings show that medical graduates' research competencies require improvement, particularly in the areas of study design, execution, and interpretation. The results imply that the gender effect is mediated by intrinsic motivations for pursuing a PhD	The findings are based on data from five faculties in Bavaria; nevertheless, due to contextual variations, such as improved training of research skills in redesigned medical programs, the findings may differ despite the large data base.	Using the scale at different points in time from the beginning to the end of the study programme could reveal in which phases competence acquisition takes place and in which phases it stagnates. On this basis, targeted adjustments could be made to the curriculum.
10		Review paper aims to offer deep insight into the issues affecting doctoral students by reviewing and critically analyzing recent literature on the doctoral experience	In this paper, 163 empirical articles about PhD education are examined and analyzed. Following the retrieval of all pertinent articles, the first author read and used a conventional content analysis method to analyze them.	. The prior review contained factors that may be simply categorized as internal or external to the PhD candidate. In this review, external influences are those relationships and systems involving people, things, and organizations outside of the student that could directly or indirectly affect their advancement toward a PhD.	It is important to note that although this review paper explored these external and internal variables as discrete contributing factors, they are nonetheless largely intertwined.	Future research in which the confluence of the factors discussed in this review, particularly With respect to the cross-cutting impact of socialization variables, is recommended
11		Based on our experience as graduate and postdoctoral program leaders, we recognized the need both to identify core competencies and to develop a process to assess these competencies.	Qualitative study. Proposal for a competency-based framework	Rather, we identified observable behaviors that align with the basic competencies and show how knowledge, abilities, and attitudes evolve over the course of training. We identified ten fundamental skills from the combined list that are necessary for all PhD scientists, regardless of field or career choice.	Potential confirmation bias	We suggest that such a competency-based assessment be used to guide periodic feedback between PhD students or early-career scientists and their mentors or supervisors.
12		concerns about the competencies developed through doctoral training to make the candidate	In this context, we performed a national survey answered by 2794 PhDs.	A reference framework containing 111 competencies organized in 6 main	Soft skills need to be addressed	study therefore demonstrates that PhDs develop a set of common competencies and

		ready for the industry		categories was built.		delineate its boundaries.
13		Study focuses on doctoral students' professionalisation as future academics across academic disciplines,	. The current study employs descriptive and regression analyses to compare the factors impacting doctorate students' assessed skills in terms of tasks, concepts, and attitudes. It does this by using data from 490 respondents in Hong Kong.	Results show that the competencies of doctoral students are influenced by various factors, such as curricula, supervision style and learning culture.	Small sample size and single region study	Study suggests that the formal and informal learning experiences of doctoral students must be carefully designed and implemented to foster the development of their professional knowledge, skills and values.
14		Developing a comprehensive list of statistical competencies that can be used as a guide for what medical research learners should know about statistics	Delphi technique, 18 experts in biostatistics, epidemiology, and research design proposed levels for the 21 statistical competencies.	According to our research, students who want to be primary investigators need to comprehend more than students who want to be coinvestigators do. Rather than offering a one-size-fits-all solution, educational institutions should think about evaluating their learning alternatives to make sure that information is provided at all levels.	More stake holders should be included.	This work will help strengthen statistical training to medical research learners and can help enhance undergraduate statistics education.
15		Main aim of this project is to improve the quality of doctoral education by implementing new teaching methodologies based on interdisciplinary approaches and international cooperation.	Delphi technique, expert group	Structure, content and main competences required for training highly qualified researchers.	Not an independent study	Developing communicative skills by PhD students in the framework of Foreign Language Course which is included Doctoral degree programs.
16		Testing the viability of developing a script concordance exam to gauge clinical reasoning and critical thinking abilities in the field of hematology. 2. Sharing test creation and validation experiences to help others duplicate the procedure for additional pathological areas	The experts' reactions and their satisfaction about the test were obtained.	Analysis performed with 22 vignettes having 66 items revealed a statistically significant difference between the scores of the experts and the students.	More focus on assessment of competence	Using AMEE Guide 75 and our in-detail description of the process of development, optimisation and validation of script concordance test will enable faculty in many specialities to develop and include it for use in their respective fields.

17		To critically review the African scenario with respect to doctoral supervision for Basic Medical Sciences and proffer potential solutions in the form of a supervisory model.	Narrative review of literature, critical appraisal of the current prevalent scenario, and proposition of a supervisory model.	This article presents a model that might employ effective, innovative, and practical approaches to address the current situation.	There is a need to conduct research on relevant subjects to provide further insight into the prevalent scenarios, the root cause of the problems and postulate potential solutions to the problems.	A model that might employ effective, innovative, and practical approaches to address the current situation.
18		Aimed primarily at preparing students for innovative roles in their fields, they include variously structured approaches to curricular offerings, as well as other program components applicable across specialties (eg: supervisor support, scientific conduct, transferable skills).	Qualitative study	The conceptual underpinnings, justification, structures, and ten building blocks of the resulting interdisciplinary PhD program are described in this article. These include student portfolios, thematic training, interdisciplinary research seminars, student-initiated interdisciplinary activities, financial support for course participation, top-up and extension stipends, PhD supervision, research integrity, alumni follow-up network, and promotional tools like a dedicated website.	The PPHS needs to be interpreted in the context of a policy that provides major incentives for PhD education.	Based on European norms, the Basel PPHS represents the cutting edge of health sciences PhD education and provides other organizations with advice from program conception to launch for multidisciplinary PhD programs in the health sciences.
19		To present revised core competencies for doctoral programs in health services research (HSR), modalities to deliver these competencies, and suggested methods for assessing mastery of these competencies.	Update/ review article. Core competencies were originally developed in 2005, updated (but unpublished) in 2008, modestly updated for a 2016 HSR workforce conference, and revised based on feedback from attendees. Additional feedback was obtained from doctoral program directors, employer/workforce experts	The current version (V2.1) competencies include the ethical conduct of research, conceptual models, development of research questions, study designs, data measurement and collection methods, statistical methods for analyzing data, professional collaboration, and knowledge dissemination.	However, there is little evidence to support this supposition or the conditions under which these modalities realize optimal student outcomes.	Core competencies in HSR are a continually evolving work in progress because new research questions arise, new methods are developed, and the trans-disciplinary nature of the field leads to new multidisciplinary and team building needs.
20		One Health (OH) is an integrated approach that aims to sustainably balance and optimize the health of people, animals, and	Commentary/Review	. To address the complexity of OH concerns in socio-ecological systems, trainees must grasp the fundamentals of multiple disciplines,	How to develop doctoral OH programs that are coherent with their educational objectives still requires more work.	To maximize the impact of future OH research and interventions.

		ecosystems. On the basis of a review of OH doctoral programs, we advocate for integrating social-ecological systems thinking in OH doctoral training		including the social sciences. Systems thinking must be integrated in OH core competencies.		
21		The EU-funded CHAMELEONS project aimed to identify and fulfill the needs of Ph. D. students towards pursuing a career in digital and connected health industry.	A range of courses or educational material provided by CHAMELEONS consortium members, or available in open platforms were identified, organized and offered to 15 students of diverse background, enrolled in the program through a State-of-the-Art (SotA) toolkit.	Students selected courses not actually improving hard skills needed for their research, but soft skills in the business and career management direction, focusing mostly on creativity, innovation, and communication.	More diverse groups should be included	The students mentioned that the drive for their selection was based on self-awareness tools which identified the underdeveloped skills required for a successful career.

List of Citations included in the Review:

Serial No.	Title of study	Citation
1.	Curriculum Content and Evaluation of Resident Competency in Clinical Pathology (Laboratory Medicine) A Proposal.	Smith BR, Wells A, Alexander CB, Bovill E, Campbell S, Dasgupta A, Fung M, Haller B, Howe JG, Parvin C, Peerschke E. Curriculum Content and Evaluation of Resident Competency in Clinical Pathology (Laboratory Medicine) A Proposal. Pathology Patterns Reviews. 2006 Jun 1;125(suppl_1):S3-7.
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3.	Training pathology residents to practice 21st century medicine: a proposal. Academic Pathology.	Black-Schaffer WS, Morrow JS, Prystowsky MB, Steinberg JJ. Training pathology residents to practice 21st century medicine: a proposal. Academic Pathology. 2016 Sep 27;3:2374289516665393.
4.	The doctorate in clinical laboratory sciences: a new curriculum to enhance the connection of the laboratory to health care providers.	Salazar JH, Zahner CJ, Freeman VS, Laposata M. The doctorate in clinical laboratory sciences: a new curriculum to enhance the connection of the laboratory to health care providers. Academic Pathology. 2021 Aug 6;8:23742895211034121.
5.	The CanMEDS Competency Framework in laboratory medicine: a phenomenographic study exploring how professional roles are	Bogaty C, Frambach J. The CanMEDS Competency Framework in laboratory medicine: a phenomenographic study exploring how professional roles are applied outside the clinical environment.

	applied outside the clinical environment.	Canadian Medical Education Journal. 2024;15(1):26-36.
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8.	The role of research competence as an influencing factor for the careers of young academics. Findings and implications from studies on doctorates in medicine and life sciences in Germany.	Epstein N, Eberle J, Meuleners J, Lachmann D, Heuser S, Herzig S, Neuhaus B, Fischer MR. The role of research competence as an influencing factor for the careers of young academics. Findings and implications from studies on doctorates in medicine and life sciences in Germany. <i>GMS Journal for Medical Education</i> . 2023;40(6).
9.	The Munich Research Competence Scale: Research Competence among Doctoral Candidates and Graduates in Medicine Results from the second Wave of the Bavarian Graduate Study in Medicine	Epstein N, Reimer M, Gartmeier M, Fischer MR, Berberat PO, Huber J. The Munich Research Competence Scale: Research Competence among Doctoral Candidates and Graduates in Medicine Results from the second Wave of the Bavarian Graduate Study in Medicine. <i>Beiträge zur Hochschulforschung</i> . 2021;4:210-26.
10.	The PhD experience: A review of the factors influencing doctoral students' completion, achievement, and well-being.	Sverdlík A, Hall NC, McAlpine L, Hubbard K. The PhD experience: A review of the factors influencing doctoral students' completion, achievement, and well-being. <i>International Journal of Doctoral Studies</i> . 2018 Sep 16;13:361-88.
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15.	Development of soft skills by doctoral students.	Valeeva E, Ziyatdinova J, Galeeva F. Development of soft skills by doctoral students. In <i>The Impact of the 4th Industrial Revolution on Engineering Education: Proceedings of the 22nd International Conference on Interactive Collaborative Learning (ICL2019)–Volume 2</i> 22 2020 (pp. 159-168). Springer International Publishing.
16.	Addressing the need to develop critical	Kelkar AJ, Bhandary S, Chacko TV. Addressing the need to develop

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21.	Identifying the ph. D. Students'needs for career enhancement skills.	Kosvyra A, Filos D, Cusack T, Chouvarda I. Identifying the ph. D. Students'needs for career enhancement skills. Education Applications & Developments VIII Advances in Education and Educational Trends Series Edited by: Mafalda Carmo. 2023:276.

Discussion

a) Compilation and Synopsis

Graduates of doctoral degrees in the medical sciences have the advanced knowledge and abilities necessary to take on leadership roles in clinical practice, research, and education. Different programs place different emphasis on different essential competencies.

Numerous important issues emerge from the literature on the abilities of doctorate candidates in the medical sciences.

b) Knowledge Specific to a Discipline

A thorough awareness of the latest research trends and the scientific underpinnings of the particular discipline of medical science.

C. Research Skills: The capacity to plan, carry out, evaluate, and interpret scientific research; this includes

having a solid understanding of data analysis, statistical procedures, and research **methodologies**.

Critical thinking is the ability to assess scientific literature critically, formulate research questions, and create solid research methods.

Communication Skills: Ability to effectively communicate both orally and in writing to audiences in the scientific and lay domains in order to share research findings. articles grant proposals, creating scientific presentations, and producing scientific articles are all included in this.

Maintaining ethical standards in research, such as authorship rights, data management, and scientific integrity, is a sign of professionalism and responsible conduct.

Research abilities, critical thinking, clinical reasoning, multidisciplinary knowledge, and communication were the main capabilities found. The implementation of

competency-based approaches has brought to light some notable challenges, such as inadequate curriculum design, scarce faculty assistance, and insufficient resource allocation. Obstacles like lack of experience and time constraints

Research abilities, critical thinking, clinical reasoning, multidisciplinary knowledge, and communication were the main capabilities found. The implementation of competency-based approaches has brought to light some notable challenges, such as inadequate curriculum design, scarce faculty assistance, and insufficient resource allocation. Time restrictions and a lack of experience were highlighted as further barriers. In order to present a competency-based model that focused on the outcomes, various assessment techniques were suggested, such as script concordance tests, entrustable professional activities (EPAs), and qualitative evaluations. Research has demonstrated the significance of continuous evaluation and input in guaranteeing the achievement of competencies. As a step toward outcome-based medical education, competency-based training has been linked to improved readiness for roles in the industry and modern medical practice. According to reports, PhD holders were hired to work as instructors, laboratory directors, and business executives. The major competencies identified were research skills, critical thinking, clinical reasoning, interdisciplinary knowledge, and communication. The prominent issues highlighted in implementing competency-based approaches, including lack of faculty support, weak curriculum design, and limited resource allocation. Suggestions were made to include soft skills development, interdisciplinary perspectives, and alignment with industry needs. Some studies identified gaps in competency development, particularly in areas such as study design, implementation, and interpretation.

C. Appraisal of the Literature

The literature on competencies for doctoral candidates in medical sciences highlights a focus on research-driven expertise. However, some potential grey areas are evident which are relatively less mentioned such as:

Interpersonal Skills: While communication skills are mentioned, there may be less emphasis on collaboration, teamwork, and conflict resolution – crucial for navigating complex research environments.

- **Teaching Skills:** Doctoral programs may not fully prepare graduates for teaching roles, which could be particularly relevant for those pursuing academic careers.

- **Leadership Skills:** Leadership development might be under-represented, even though doctoral graduates are expected to take the initiative and lead research teams.

Conclusion

The body of research emphasizes how crucial competency-based methods are to training PhD candidates for a variety of medical scientific careers. But in order to overcome implementation obstacles, adjust to changing industry demands, and guarantee the efficacy of competency-based training initiatives, more research and innovation are required. Consequently, merely stating the significance of competency-based education would not fulfill the review's objectives; rather, it emphasizes the necessity of developing impartial procedures for these competency-based approaches' implementation and evaluation. Overall, the literature highlights the importance of competency-based approaches in preparing doctoral candidates for diverse career paths in medical sciences. However, there is a need for ongoing research and innovation to address implementation challenges, adapt to evolving industry demands, and ensure the effectiveness of competency-based training programs. Therefore, mere identification of the importance of competency based education will not suffice the purpose of the review, infact it points towards the need to establish objective methods of implementation and assessment of these competency based approaches.

Limitations

Limitations included small sample sizes, lack of regional focus, and potential biases in survey-based research

Recommendations

- This scoping review will open avenues for researchers to develop a competency framework for the doctoral candidates in diagnostic healthcare fields.
- It will also form a foundation to develop a competency-based curricula for PhD in Diagnostic Healthcare fields.
- Entrustable professional activities against each competency may be developed to contribute towards outcome based medical education.

Further Research Opportunities

- Investigate the specific competencies required for different career paths in medical sciences (e.g., academia, industry, government).

- Explore the integration of transferable skills (e.g., interpersonal skills, leadership) into doctoral programs.
- Assess the effectiveness of current doctoral programs in preparing graduates for the demands of a medical science career.

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