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ORIGINAL ARTICLE

Identifying entrepreneurship competencies for undergraduate medical students: a qualitative case study from Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Objective: To identify key entrepreneurship competencies for undergraduate medical students studying in different public and private medical colleges of Khyber Pakhtunkhwa, Pakistan, and explore perceptions regarding their inclusion in the medical curriculum.

Methods: This qualitative case study was conducted from May to October 2023 in one public and one private medical university and their affiliated colleges at Khyber Pakhtunkhwa. Sixteen purposively selected participants, including vice chancellors, deans, hospital administrators, medical educationists, entrepreneurs, and Offices of Research, Innovation and Commercialization (ORICs) representatives, were interviewed. Data were analyzed thematically following Braun and Clarke's six-step framework.

Results: Participants unanimously agreed that entrepreneurship education should be integrated into undergraduate medical training. Reported drivers included family influence, altruism, and financial stability, while awareness of entrepreneurship was mostly acquired informally through reading, media, or peer interactions. The core competencies identified were financial management, critical thinking, innovation, leadership, risk management, advertising skills, and creativity. Barriers such as limited financial resources, lack of time, and insufficient institutional support were also noted, along with practical tips emphasizing resilience, work-life balance, and lifelong learning.

Conclusion: Our study identified the need for structured entrepreneurship training among undergraduate medical students to develop seven core competencies: financial management, critical thinking, innovation, leadership, risk management, advertising skills, and creativity. Incorporating these into the curriculum may prepare future doctors as innovators, enhance healthcare delivery, and improve patient outcomes. Further research is warranted to validate these competencies and assess their impact in the Pakistani context.

Keywords: Entrepreneurship (MeSH); Education, Medical, Undergraduate (MeSH); Competencies, Clinical (MeSH); Student, Medical (MeSH).

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INTRODUCTION

Entrepreneurship is the ability of an individual to transform ideas into practice. It involves planning, managing projects, and mobilizing resources to achieve defined goals, while also encompassing creativity, innovation, and risk-taking. Entrepreneurs provide a strong foundation for both social and commercial activities.[1] In general, entrepreneurship involves organizing and coordinating resources, managing risks, challenging conventional approaches, and exploring, identifying, and capitalizing on new opportunities.[2,3] Entrepreneurship in the health sector represents a mindset of innovation and problem-solving aimed at improving clinical processes, enhancing health outcomes, and reducing costs.[4] It translates ideas into practical initiatives, services, and products. Medical education already fosters core competencies such as critical observation, inquiry, experimentation, and association, which align closely with entrepreneurial skills.[5] By integrating entrepreneurship, medical students and physicians can adopt more efficient and cost-effective patient care strategies while developing skills that strengthen future clinical and professional practice. In this context, health entrepreneurship also facilitates the creation of new services that expand access to essential care and improve overall productivity.

There is a shift in patients' attitudes from being passive recipients of care to becoming active participants, which has reshaped service delivery dynamics and raised expectations from healthcare providers.[6] Physicians equipped with entrepreneurial knowledge and skills are better positioned to understand patients' needs and enhance patient satisfaction.[7] Successful medical entrepreneurs can bridge critical gaps in the existing healthcare market, thereby strengthening the connection with patients and improving service provision.

The healthcare industry is highly complex, with challenges in service delivery, organizational structures, and financing.[8] While innovative solutions can address these issues, healthcare professionals have traditionally been less adaptable to change compared to other sectors that readily integrate technology.[9] Training in entrepreneurial skills is therefore crucial for medical graduates to foster innovation and translate ideas into effective products and services.[10] Globally, many medical schools have integrated leadership, advocacy, and quality improvement into curricula, as seen in Brown University's

program on Medical Technology, Innovation, and Entrepreneurship.[11] In contrast, such initiatives are rare in developing countries like Pakistan, where overcrowded curricula and limited resources remain major barriers.[12] Although some institutions mention entrepreneurship in their mission statements, it is seldom implemented in undergraduate programs.[13] In resource-limited settings, entrepreneurship education could enhance innovation, patient care, and system efficiency, provided that curriculum constraints are addressed through stakeholder consensus and effective strategies.

In the United States, combined MD-MBA programs are a common pathway for providing entrepreneurship training.[14] However, these dual programs are costly, time-intensive, and accessible only at the graduate level. A more practical solution is to integrate entrepreneurship, innovation, and leadership training directly into medical curricula. In Pakistan, only a few institutions, such as Khyber Medical University (KMU) through its PRIME (professionalism, research, identity, management, leadership, and ethics) module, have introduced elements of entrepreneurial skills. The absence of entrepreneurship in the standard undergraduate medical curriculum outlined by the Pakistan Medical and Dental Council (PMDC) also signifies the need for targeted efforts to embed such training.[15] Accordingly, the present study was planned to identify entrepreneurship competencies for undergraduate medical students in various public and private medical colleges of Khyber Pakhtunkhwa, Pakistan.

METHODS

This case study was conducted over six months (May-October 2023) at one public and one private university and their affiliated medical colleges in Khyber Pakhtunkhwa. A total of 16 in-depth individual interviews, each lasting 30-50 minutes, were conducted by the same researcher to ensure consistency. The study aimed to identify entrepreneurship competencies for undergraduate medical students. For this research, health-related entrepreneurs were defined as medical professionals engaged in health-focused business or innovation activities (e.g., establishing clinics, developing digital health applications, or launching healthcare enterprises), as well as those affiliated with Offices of Research, Innovation and Commercialization (ORICs). Purposive sampling was used to recruit participants, which included medical doctors serving as administrators, medical directors, hospital directors, deans, vice chancellors, medical educationists, health entrepreneurs, and physicians working in ORICs and business incubation centers (BICs) of public and private sector institutions.

The interview guide was developed through focus group discussions with field experts (Annex A). To ensure content validity, a pilot study with five participants was conducted; these participants were later excluded from the main study to minimize potential bias. Construct validity was assessed using the Lynn criteria, with five subject experts reviewing the tool against a predefined threshold of 0.80.[16] The final guide comprised ten open-ended questions aligned with the study's objectives, allowing participants to freely express their views. Ethical approval was obtained from the Advanced Studies and Research Board (ASRB) of Khyber Medical University, Peshawar (Ref# DIR/KMU-AS&RB/IE/001645, dated 11-04-2022) and from the Ethics Board of the Institute of Health Professions Education and Research, KMU (Ref# 1-8/IHPER/MHPE/KMU/23-60, dated 15-04-2022). Written informed consent was obtained prior to data collection.

Thematic analysis: Qualitative data were analyzed via thematic analysis, which is a reliable method for analyzing textual data and drawing meaningful conclusions by identifying common response patterns. We combined codes to generate categories transformed into significant themes on the basis of commonality. Braun and Clarke's (2006) six-phase framework was followed for thematic analysis.[17] The following steps are followed:

Familiarity with data: In the first step, we thoroughly read and reread queries of the qualitative data so that we could familiarize ourselves with them. We then highlighted and jotted down the initial impressions and took notes while reviewing the data.

Code generation: In this step, the data were organized systematically. The data were coded here to reduce the enormous corpse into meaningful, smaller chunks. Considering the queries, all information relevant to the research was coded.

Searching for themes: Once the codes were generated, common response patterns were identified, and those that fit together were merged to form one theme. Themes describe the patterns in response to the research question.

Reviewing themes: The themes identified in Step 3 were repeatedly examined to ensure that they made sense and addressed the research questions. The data were reviewed and compared to determine if they related to the theme in which they were fit. The overlapping of any theme was also identified, and such overlaps were eliminated.

Defining themes: In the final step, themes were refined to capture their core concepts, and a thematic map was developed to illustrate relationships between themes and subthemes.

Write up: Once finalized, each theme was described and interpreted in context to provide meaningful insights.

RESULTS

To address the study's objectives, interviews were subjected to thematic analysis that revealed the participants' core perceptions and understanding of health entrepreneurship. Table 1 presents the themes, categories, and codes that emerged from the interviews. Each theme has been described and exemplified with excerpts from the interviews while maintaining participants' privacy and anonymity.

Participant details: A total of 16 interviews were conducted with the experts. There were 14 male and two female participants. The mean age of the participants was 56.56 years (Range

Table I: Codes, categories, and emergent themes from thematic analysis of health entrepreneurship competencies

Codes	Categories	Themes	Codes	Categories	Themes
Role of Parents	Family influence	Stimulations / Drivers Behind Goal Achievement	Quality Management	Enterprise launching competencies	Health Entrepreneur Competencies
Family pressure			Financial Management		
Family environment			Risk Management		
Ambition	Individual drivers		Communication Skills		
Financial Stability			Trained and knowledgeable entrepreneurs	Inclusion of Entrepreneurship in the curriculum	Need for teaching Health Entrepreneurship
Humanity and altruism			More competent health entrepreneurs		
Through interaction	Learning entrepreneurship	Knowledge and awareness about Entrepreneurship	Entrepreneurship Requires institutional support		
TV and Netflix programs			Evolving with market needs		
Reading			competent and skillful health professionals		
Courses/training related to Entrepreneurship			Endurance	Developing Entrepreneurship competencies through curriculum	
Managing different aspects of an activity	Defining Entrepreneurship		Practical implementation of ideas		
Doing business			Creativity		
Small to big business			Leadership and initiation		
To Earn			Lack of workforce/HR for teaching entrepreneurship	Barriers	Sustaining Health Entrepreneurship
Innovation			Lack of financial resources		
Leadership	Enterprise managing competencies	Health Entrepreneur Competencies	Time management		
Systematic Planning			Courage to initiate	Practical Tips	
Creativity			Fight back failures		
Initiative			Learn		
Critical thinking	Enterprise launching competencies	Health Entrepreneur Competencies	Commitment and dedication		
Problem Solving			Work-Life Balance		
Health Advocacy			Management		

42 to 72 years). The participants comprised two Vice Chancellors, three Deans/Principals, three Hospital Directors/Administrators of Hospitals, two Medical Directors, One from ORIC, three medical educationists, and two Medical Entrepreneurs.

Code, Categories, and Themes: The codes, categories, and themes are described in Table I.

The main themes extracted from the interviews were as follows:

Theme I: Stimulations/drivers behind goal achievement: It describes the stimulators or drivers the participants had to pursue their careers in the health sector. The participants highlighted that their family had mainly pulled them to opt for the health sector to pursue their careers. Many of the participants decided to be a doctor to fulfill their parent's dream/wish, as narrated by the participants:

"*I always was ambitious, and coupled with*

Table II: Comparison of current study with international literature

Competency	Current Study	International Literature (Niccum BA 2017 and Suryavanshi T 2020)[4,12]
Innovation	Yes (Innovation, Creativity)	Yes (Innovation, Idea generation, Design thinking)
Leadership	Yes (Leadership)	Yes (Leadership, Team building)
Business Skills	Yes (Financial management, Risk management, Advertising skills)	Yes (Business of medicine, Securing funding, Commercialization)
Critical Thinking	Yes (Critical thinking)	Yes (Enhanced adaptability, Design thinking)
Technology	No	Yes (Technology)
Healthcare Systems	No	Yes (Healthcare systems)

that, I was a hard-working student. It was suggested to me by my parents that they wished for one of their children to be a doctor." (P3)

Another reason to choose the health sector was altruism, which gives them a sense of satisfaction and adds to their personal and professional growth, as evident in the following quote:

"*It started from childhood. There were almost no health facilities in rural areas. Therefore, I always felt there was no care and help for rural people. That stimulated me to become a doctor*". *(P10)*

"*My father was a general duty pilot, and when I was a child, in the 1971 war, he was seriously injured in the front of Mianwali. I went with my mother to that place, being the eldest son. My sister was the eldest, but she was left with my grandmother. In addition, I was clinging to his bed toward his feet. For 21 days, he had not recovered. On the 20th or 21st day, I change to do not recall exactly, he opened his eyes, and I started crying. I was frozen in the moment I wanted to go and tell him, Daddy, I love you. However, I could not. In addition, he opened his eyes and told me there is a God. That day, I realized that I needed to do something in my career where I can bring change and serve humanity." (P9)*

In addition to family influence, there are personal goals or dreams that an individual strives to achieve. Many opted for this profession to secure a job that was more stable and financially sound, as narrated by a participant:

"My main stimulator is financial stability and working in a planned manner and not haphazardly." (P8)

Theme 2: Knowledge and awareness of entrepreneurship: Under this theme, three categories emerged: learning entrepreneurship, courses/training on entrepreneurship, and defining entrepreneurship. The results revealed that participants acquired knowledge and understanding about the concept of "entrepreneurship" by reading about it and watching informative programs on TV and Netflix and that this process also occurred after graduation, as narrated by a participant:

"*No! Not during undergrad, but later, when I got time, I read and saw TV programs on the subject. I also followed a Netflix series for the same when I was a medical director". (P6)*

The participants also highlighted that they learned about entrepreneurship through interactions with knowledgeable others:

"I did not attend any formal course, but when we sit with experienced people or elders, this is like a course as they share their experiences. For example, I have 30 years of experience in academics and administration; someone who will sit with me will learn. This is how I learned from people and their experiences." (P4)

The results of the study also revealed that no significant courses or training sessions are offered in medical colleges or other health institutions that could enhance their competencies in entrepreneurship. The participants had yet to have an opportunity to attend practical courses or training on entrepreneurship, as supported by the following statements.

"*We are in Pakistan; it is a dilemma that we are not provided with such courses.*" *(P11)*

"Not truly. Our university did not provide any such courses during our degree program." (P7)

The participants were asked to define concept/term entrepreneurship. A significant majority have associated it with business and commerce, as evident by the verbatims

"I think, putting it very simplistically, entrepreneurship is the process of setting up a business, taking it from an idea to realization while considering all the risks and the benefits involved." (P1)

"Like a collection of those activities that are related to business" or "Starting a business from scratch." (P13)

Apart from this, it was taken as a source to earn money and obtain financial stability, as highlighted by a participant:

"*Fundamentally, I can say to earn for yourself. In addition, earn for yourself and other people.*" *(P12)*

Another participant put it this way:

"I think any activity and product that can help you improve your financial status." (P15)

The results also revealed that the participants had defined entrepreneurship concerning innovation as narrated by the participants:

"To do something new." (P2)

"*It is just an idea that is in your mind and emerging with the challenges surrounding you, and on the basis of that idea, you produce a certain product. The product can be a student, a curriculum, or any other business idea.*" *(P16)*

"*Entrepreneurship is thinking of ways and means, which is probably not obvious to*

the common eye, and finding a niche that helps you find that solution. They are innovative, creating, up to the mark, and cost-effective solutions." (P5)

Theme 3: Entrepreneur Competencies: The study's results revealed a range of entrepreneur competencies that the participants highlighted. These competencies can be divided into three main categories: enterprise launching competencies, enterprise managing competencies, and relationship competencies. Enterprises launching competencies mainly include leadership, systematic planning, initiative, creativity and innovation, consistency, hard work, passion, and dedication. These are the competencies that a person must be equipped with to begin an entrepreneurship venture, as narrated by different participants:

"*Consistency, hard work, and passion to become a successful entrepreneur because they are on a way where there would be many failures.*"

"*Leadership. Initiation and knowing the worth of something*". (P13)

"*I think creativity because we need to think and brainstorm first*" .(P5)

"*They should have a clear idea of what they want to do or what setup they want to do. I think a clear picture of that is needed.*" (P14)

Once you successfully initiate an enterprise, a person must manage it, and for that, they must be equipped with enterprise-managing competencies that include risk management, problem-solving, commitment, critical thinking, quality assurance, and competence.

"*It is not just financial aspect, of course, it is core, but there must be leadership and problem-solving, critical thinking and commitment to cause.*" *(P2)*

In addition, one should be capable of competing with market giants by keeping up with the changing market trends as supported by a participant:

"Competence. Because we have both local and international competition." (P9)

Finally, there are relationship competencies that refer to building healthy, profitable, and strong relationships through communication skills, building public relations (PR), and interacting with the business community in the targeted market.

"Good communication skills, social networking and good PR can be accomplished by attending national and international conferences." (P7)

Theme 4: Need for Teaching Health Entrepreneurship: In terms of the inclusion of entrepreneurship in the curriculum for undergrads in the health sector, the majority agreed with it and found it beneficial. The participants believed that including entrepreneurship in the curriculum would give rise to more trained, competent, and knowledgeable entrepreneurs.

"*It would be good if the medical degree also offered courses; we did not even have a single entrepreneurship course. People become more competent when they learn from mentors about entrepreneurship and how to do it*". *(P4)*

Moreover, some students intend to become entrepreneurs but need more support from their educational institutes. Adding an entrepreneurship course should assist them in excelling in the modern world, which offers fierce competition. The participants highlighted that the course of entrepreneurship would be an additional skill for health professionals, as narrated by one participant:

"*In times like these, where there is extreme competition and market saturation, I think it is essential to let the students have an additional skill.*" *(P1)*.

The participants also highlighted that entrepreneurs need to be competent in establishing health entrepreneurship. They highlighted that some competencies could be taught and developed through the course of entrepreneurship in the curriculum. These competencies include endurance, practical implementation of ideas, innovation, leadership skills, and initiation. A participant highlighted:

"Teaching entrepreneurship teaches people who give up is never an option when you put your mind to anything". (P9).

Additionally, a participant could teach practical implementation of the ideas as narrated.

"*How can they get the attention of investors and get their ideas and venture capital?*". *Something like that should be included in the curriculum*". *(P8)*

Theme 5: Sustaining Health Entrepreneurship: Barriers and Practical Tips: It is evident from the interviews that the path to entrepreneurship could be smoother. There are several barriers to health entrepreneurship that participants repeatedly highlighted. Most importantly, they find time management hard when dealing with their studies, which requires considerable time and effort.

"*It is difficult to give time besides your studies, so time management.*" *(P7)*

Second, financial barriers prevent them from initiating an enterprise or bringing innovation and risks.

"*Financial barriers, I would say. In my case, that stopped me from doing something differently.*" *(P14)*

Moreover, another critical factor was the need for a larger workforce. An entrepreneur requires skilled workers and professionals to compete in the market with innovative ideas that they struggle to find, as highlighted by a participant:

"*There is always a lack of human resources for teaching entrepreneurship.*" *(P6)*

To address these barriers, the participants developed some practical tips, which are described below.

The study participants were asked to give practical tips to overcome the hurdles an undergraduate student would face in initiating an enterprise. It was highlighted that one should have courage, the ability to fight back against failure, be open to learning, work life balance, management, and commitment, as evident by the following statements:

"Have the courage to start it and then just go for it." (P12)

"Maintain equilibrium between work and family" .(P2)

"*Dedication and commitment toward your goals, work, and family.*" *(P16)*

"*Be involved in cocurricular and be a lifelong learner.*" *(P7)*

Overall, the results section described the participants' perceptions, understanding, and opinions regarding health entrepreneurship.

DISCUSSION

Entrepreneurship plays a vital role in enhancing employability and improving the quality of healthcare services, making it increasingly relevant in medical education. With the saturation of the medical profession, innovation, central to entrepreneurship, has become essential for sustainable progress. This study sought to identify entrepreneurial competencies among undergraduate medical students in Khyber Pakhtunkhwa. Findings highlighted seven core competencies: financial management, critical thinking, innovation, leadership, risk management, advertising skills, and creativity. These directly address the study's objective and emphasize the skills required for successful health entrepreneurship. Additional themes, including family influence, personal motivation, and practical strategies, further contextualize the significance of these competencies within the professional and cultural environment.

Exploring the stimulations/drivers that medical undergraduate students have behind their degrees is essential. This offers insight into how motivated and interested they are to excel in their field. Family and the immediate environment play significant roles in addition to their interests, especially altruism. Similar results have been reported in another study, where family expectations, parents' desires, and altruism were the primary motivators behind career choice in a collectivistic culture.[18] Studies have shown that such students are more committed to their studies and perform better.[19]

Furthermore, the study revealed that most undergraduate medical students were unfamiliar with the concept of entrepreneurship, and those who had some awareness primarily gained it through informal sources such as reading, television programs, or online media. No formal entrepreneurship courses were offered. This highlights the urgent need to integrate entrepreneurship training into the medical curriculum, as emphasized by Li.[20] Such inclusion could expand career opportunities while fostering scalable, sustainable, and productive solutions in the health sector, as highlighted by Becker, Chahine, and Shegog.[21]

Consistent with previous studies, participants largely defined entrepreneurship in terms of business and commerce, viewing it as initiating a venture to achieve financial stability or expanding a small enterprise through innovation.[22] They also associated it with managing activities from start to finish, encompassing all essential components. Notably, despite the absence of formal training or coursework, participants were able to articulate the concept accurately. The findings further indicate that participants recognized the significance of entrepreneurship and strongly advocated for its inclusion in undergraduate medical curricula to promote more sustainable career pathways.[23] This aligns with Wulfovich and Meyers, who emphasized that entrepreneurship provides viable and sustainable career opportunities, particularly in the health sector, which is increasingly saturated and in need of innovative approaches.[24]

Establishing health entrepreneurship requires a set of entrepreneurial competencies to build sustainable enterprises. Participants of this study identified key competencies including leadership, initiative, creativity and innovation, time management, dedication, commitment, critical thinking, problem-solving, quality assurance, relationship-building, and systematic planning. These findings are consistent with existing literature, which emphasizes that such competencies are essential for becoming successful entrepreneurs and sustaining enterprises across sectors.[25,26]

Participants further emphasized that certain entrepreneurial competencies could be cultivated among undergraduate medical students through the integration of entrepreneurship courses into their curriculum.[27] These include endurance, practical implementation of creative ideas, time management, leadership, and initiative. Equipping students with such skills would enable them to conceptualize and plan entrepreneurial ventures while applying the technical and theoretical knowledge necessary to establish health enterprises .[28]

The competencies identified in this study (financial management, critical thinking, innovation, leadership, risk management, advertising skills, and creativity) are broadly consistent with those reported in international literature.[4,12] However, the greater emphasis on financial management and advertising skills may reflect context-specific needs in Pakistan's healthcare system. In contrast, international programs frequently highlight competencies such as technology integration and healthcare systems knowledge, which were less prominent here, likely due to resource constraints in developing countries. A detailed comparison of these competencies, including shared and context-specific elements, is provided in Table II. Finally, the study findings revealed that health entrepreneurship is not without hurdles.[29] Participants identified limited financial resources, inadequate human resources, and poor time management as key barriers preventing medical students from pursuing entrepreneurial initiatives. Similar barriers have been reported by Sandhu MS, et al., underscoring their widespread impact on entrepreneurship.[29] Nonetheless, participants also proposed practical strategies to overcome these challenges, including resilience in the face of failure, strong commitment and dedication, effective management skills, and maintaining work-life balance. Such qualities were viewed as essential for enabling individuals to establish themselves as successful entrepreneurs.[30]

Limitations of the study

This study has several limitations. The qualitative design, sample size, and participant diversity limit the generalizability of the findings. Most participants lacked prior formal exposure to entrepreneurship, which may have introduced bias in the competencies identified. Future research employing methods such as the Delphi technique with national experts is recommended to gain deeper insights and validate these findings.

CONCLUSION

This study identified seven entrepreneurship competencies-financial management, critical thinking, innovation, leadership, risk management, advertising skills, and creativity, that are essential for undergraduate medical students in Pakistan. Structured entrepreneurship training, supported institutionally and integrated into medical curricula, could equip future doctors as innovators and entrepreneurs, thereby enhancing healthcare delivery and patient outcomes. Further research is needed to validate these competencies and assess their impact on medical education, clinical practice, and patient outcomes in Pakistan.

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AUTHORS' CONTRIBUTION

The Following authors have made substantial contributions to the manuscript as under:

MS: Conception, acquisition, analysis of data, drafting the manuscript, approval of the final version to be published

BJ: Conception and study design, drafting the manuscript, critical review, approval of the final version to be published

IH: Conception and study design, acquisition, analysis and interpretation of data, drafting the manuscript, critical review, approval of the final version to be published

ZH: Study design, critical review, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

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DISCLAIMER

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