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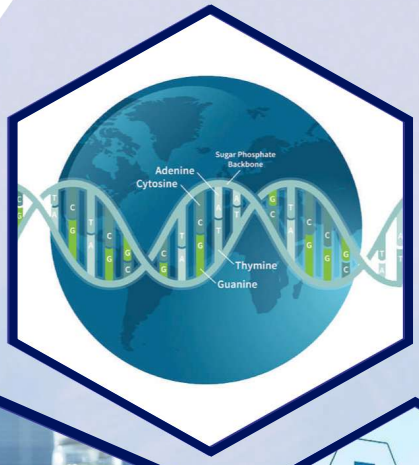


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# EDITORIAL AND ADVISORY BOARD

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**LETTER TO EDITOR**

# TRAINING UNDERGRADUATES TO DIAGNOSE ORAL CANCER

Manas Bajpai[1]*

*Cite this article as:* Bajpai M. Training undergraduates to diagnose oral cancer. Baqai J Health Sci. 2025;26(1): 01-02

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Oral cancer is a silent threat, lurking in the shadows of dental practices. With rising incidence rates, understanding this disease has never been more crucial [1]. As, future dentists, undergraduates hold the power to make a significant impact through early detection. However, diagnosing oral cancer is not always straightforward. Many challenges lie ahead for these young dental professionals as they navigate their education and training [2].

Oral biopsies are a crucial diagnostic tool in the field of dentistry, allowing clinicians to obtain tissue samples for histological examination and the identification of various oral pathologies. However, performing these procedures effectively requires specialized training and expertise. To address this need, a well-structured and comprehensive training program for undergraduate students is essential [2,3].

Chairside learning, where students receive hands-on training under the supervision of experienced clinicians, has been recognized as a vital component of modern dental education [4]. This approach allows students to develop the necessary psychomotor, communication, and cognitive skills required for performing oral biopsies. [3,4] In addition, the use of structured clinical operative tests has been shown to be an effective method for assessing the practical abilities of dental students in tasks such as simple exodontia [4].

Early detection of precancerous lesions and conditions is crucial in reducing the burden of cancer and improving patient outcomes. This is particularly relevant for oral cancer, where five-year survival rates have not improved significantly over the past decades, primarily due to delays in detection [2,5]. Addressing this challenge requires a multifaceted approach, including the development of innovative technologies and the strengthening of undergraduate education in this critical area [3].

We as mentor should train our students to not to overlook oral mucosa and other parts of oral cavity while performing dental procedures. Another promising avenue for improving early detection is the application of deep learning-based approaches. Deep learning, a subfield of artificial intelligence (AI), leverages artificial neural networks with multiple layers to analyze complex data patterns. This technology is showing immense promise in revolutionizing early detection of oral cancer, offering a more accurate, efficient, and potentially less invasive approach, such as the use of vision transformers to assist clinicians in the identification of oral squamous cell carcinoma in clinical photographs [5].

**Conflict of interest:** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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1. Krishnan RP, Pandiar D, Ramani P, Jayaraman S. Molecular profiling of oral epithelial dysplasia and oral squamous cell carcinoma using next generation sequencing. J Stomatol Oral Maxillofac Surg. 2024;126(4):102120. DOI: 10.1016/j.jormas.2024.102120.
2. Warnakulasuriya S, Kovacevic T, Madden P, Coupland VH, Sperandio M, Odell E, et al. Factors predicting malignant transformation in oral potentially malignant disorders among patients accrued over a 10-year period in South East England. J Oral Pathol Med. 2011;40(9):677-83. DOI: 10.1111/j.1600-0714.2011.01054.x.
3. Gao Y, Guo ZL, Luo HY, Wang J. Clinicopathological characteristics of malignant transformation in 85 cases of oral leukoplakia. Zhonghua Kou Qiang Yi Xue Za Zhi. 2012;47(7):410-413. Chinese. DOI: 10.3760/cma.j.issn.1002-0098.2012.07.008.
4. Atkin PA, Khan A, Simms ML. Chairside learning on undergraduate clinics: general dental and human disease themes. Br Dent J. 2024;237(3):212-216. DOI: 10.1038/s41415-024-7676-1.
5. Bajpai M, Gupta S. Dermoscopy of Oral Squamous Cell Carcinoma. J Ayub Med Coll Abbottabad. 2018;30(2):315-316.

## ORIGINAL ARTICLE

# MEDICAL STUDENTS' KNOWLEDGE AND SOCIETAL ATTITUDES TOWARDS AUTISM SPECTRUM DISORDER: A CROSS-SECTIONAL STUDY

Benish Zia[1*], Arif Ali[2], Fareeha Jawed[3], Tuba Ajmal[4], Zarlish Khan[5], Rameez Hussain[6], Hassan Zaidi[7]

## ABSTRACT

**Objectives:** This study focuses on assessing autism knowledge and societal attitude among medical students in Karachi, who represent the future of healthcare.

**Methods:** A cross-sectional study was conducted in July, 2022. The targeted population was Medical students of Dow Medical College, Karachi. A survey was conducted to obtain information related to demographics, ASD related information, ASD knowledge and societal attitude on ASD symptoms through a questionnaire. Independent sample t-test was used to compare the mean ASD Knowledge and societal attitude score with groups by using SPSS. Level of significance was set on 5% for this study.

**Results:** A total of 431students were invited to participate in this voluntary survey carried out to investigate their knowledge and societal attitude regarding ASD. Among the participants, 68.7% (296) were female, while 31.3% (135) were male. According to our results 425 out of 431 respondents were of the view that both the general public and medical students should be provided with basic knowledge regarding the symptoms and features of ASD. The study results revealed moderate to high awareness regarding autism spectrum disorder (ASD) among participants, with 64.3% recognizing it as a developmental disorder (mean = 3.62 ± 1.09). A majority correctly identified key characteristics, including poor social skills (73.3%), resistance to routine changes (70.3%), and the importance of special education (72.4%). Mean societal attitude score differed significantly ($p < 0.001$), with those who had an autistic family member 3.91±0.44 and also showed a significant difference ($p = 0.005$), with those who had attended ASD sessions, were higher mean scores (4.01±0.43) than those who had not (3.83±0.49).

**Conclusion:** The findings of this study strongly support the need for mandatory training and awareness programs on autism spectrum disorder (ASD) in medical colleges to improve the ability of future practitioners to identify and manage ASD in clinical practice.

**Keywords:** Autism Spectrum Disorder, Knowledge, Societal attitude, Medical Students, Pakistan.

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## INTRODUCTION

Autism Spectrum disorder (ASD) is a heterogeneous complex multifactorial neurodevelopmental disorder characterized by challenge in social communication and interactions [1]. These patients also exhibit repetitive or restrictive activities and behavioral patterns such as following specific daily routine, rigidity in behavior, repetitive movements and atypical response to sensory stimuli [2]. Autism Spectrum Disorder (ASD) is highly diverse in its presentation. This spectrum ranges from individuals with significant developmental delays and impairments to those with exceptional intellectual or artistic talents, making it a highly individualized disorder. The exact etiology of ASD remains unclear but involves both genetic and environmental factors [3–4]. Increased risk is associated with having a sibling with ASD, older parental age, genetic conditions such as Down syndrome or Fragile X syndrome [5–6], and very low birth weight [7].

Epidemiological studies have documented a steady rise in the prevalence of Autism Spectrum Disorder (ASD) over the past 30 years [8]. This increase could be due to factors such as improved awareness, better diagnostic tools, and broader diagnostic criteria. However, the exact reasons for this trend remain a topic of ongoing research. The estimated average worldwide prevalence of ASD is 1% [9]. Though, the reported prevalence of Autism Spectrum Disorder (ASD) varies substantially, many studies have reported higher rates in certain populations or regions. Some studies have reported autism prevalence rates as high as 3.9% in parts of Asia, [10]. highlighting regional differences in diagnosis and awareness of the condition. The Pakistan Autism Society estimates that approximately 350,000 children in Pakistan are affected by Autism Spectrum Disorder [11]. ASD is a lifelong condition that typically becomes noticeable in early childhood, often as early as 18 months or even sooner [12]. It presents with a wide range of symptoms that vary from person to person. The severity and combination of these symptoms can differ greatly among individuals [13]. At present, there is no known cure for Autism Spectrum Disorder (ASD). However, research shows that early therapeutic and behavioral interventions can lead to better outcomes and an enhanced quality of life for children with ASD [14]. Though, majority of recent guidelines specify that ASD can be reliably diagnosed in children at 18 months, while certain early signs can be evident by 13-14 months [15]. However, the actual average age at which ASD is diagnosed is 60.48 months; highlighting a significant delay in the time it takes for children to access specialized services for early intervention [16-17]. This gap suggests a critical need for earlier identification and streamlined pathways to diagnosis.

The major barrier to early screening, identification and referral of ASD lies in the limited knowledge, awareness, and specialized training among healthcare professionals [18-19]. ASD is diagnosed through clinical observation and detailed family history, as no definitive lab test exists [20–21]. Physicians must carefully assess behavior and reported symptoms. Over 80% of individuals with ASD have co-occurring conditions, including intellectual disabilities, epilepsy, ADHD, anxiety, and physical health issues like diabetes and cardiovascular disease [22–24].

It has been evidenced from researches that individuals with autism spectrum disorder (ASD) have up to 10 time greater mortality rate compared to the general population [25-26]. Many autistic individuals struggle to acquire quality care due to physicians' limited autism-specific training, low confidence, and time constraints [27]. Various studies from the U.S., Palestine, and others report poor provider self-efficacy and knowledge in managing ASD [28–29], largely due to inadequate autism-focused curricula in medical education. Child psychiatry, including autism, remains a significantly underdeveloped and overlooked area within Pakistan's healthcare system. Limited resources and inadequate training hinder physicians' ability to accurately diagnose and manage autism. The purpose of this specific study is to examine the extent of autism knowledge and awareness among the medical students in Karachi, as medical students represent the future of our healthcare system. Globally, healthcare providers often lack the skills and knowledge to effectively care for autistic children and adolescents, with over half of primary care providers reporting no prior autism-specific training [30]. There is a significant gap in research addressing autism-specific challenges within the Pakistan. The aim of this study focuses on assessing autism knowledge and societal attitude among medical students.

## METHODOLOGY

This cross-sectional study, conducted in July 2022, aimed to evaluate the knowledge and societal attitudes of medical students toward Autism Spectrum Disorder (ASD). Convenience sampling was utilized by randomly distributing questionnaire forms among students attending lectures across all five academic years at Dow Medical College, a public sector institution in Karachi that offered a five-year undergraduate program in medicine. The sample size was calculated by World Health Organization (WHO) software Sample Size Determination in Health Studies version 2.0, with estimation of population mean formula: $n = (Z^2 \times ó^2) / d^2$**.** Taking 95% confidence level, *ó* is the standard deviation (0.54) with 0.05 absolute precision. The respondents reported an aggregated mean and standard deviation 3.44±0.54 score for societal attitude toward ASD. The calculated sample size was 449. Using a non-probability, Purposive sampling method, 449 students from the MBBS program were invited to take part in the study from which 431 accepted to participate in the study. Prior to beginning the research students were guaranteed complete anonymity and written informed consent was obtained from each participant.

*Study Tool:* A survey was conducted to obtain information related to knowledge and societal attitude on ASD. The survey tool was divided into three sections. Part A gathered demographic and ASD related details of participants. ASD related questions covered areas such as whether they had attended ASD-related courses, and had relatives with ASD in Yes/No format.

Part B assessed participants' knowledge of ASD symptoms through a 20-item questionnaire designed to measure their understanding and awareness of ASD. The questionnaire was developed by modifying and updating the survey created by Stone (1987) and later adapted by other researchers [31]. while part C focused on societal attitudes toward ASD, using a 16-item questionnaire covering rights, functionality, and presence of individuals with ASD, developed by Flood et al. (2013), used in a Malaysian study by Low HM, in that study a five-point Likert scale (ranging from Strong Disagree, Disagree, Neither Disagree nor Agree, Agree, to Strongly Agree) was used instead of 4 point, to assess societal attitude among Malaysian students [30]. Part B comprised of 9 true statements (e.g. Are you aware that autism is a developmental disorder?) and 11 false statements (e.g. Do you think autism is completely curable). Part C including 3 positive statements (e.g. People with ASD should have the opportunity to go to college) and 13 negative statements (e.g. People with ASD should not engage in romantic relationships). The higher mean scores consistently reflected higher knowledge toward ASD. The scoring criteria remained the same for societal attitudes towards ASD. These sections employed a five-point Likert scale statements that were false, the scoring was reversed (e.g., strongly agree received a score of 1, and strongly disagree received a score of 5) to accurately calculate participants' overall scores before data analysis. Data was gathered through printed questionnaires, which were non-randomly distributed among medical students at Dow Medical College.

*Data Analysis:* Statistical analysis calculations were performed using SPSS 25.0. The mean± standard deviation and frequencies with percentage were reported for demographic and ASD related variables. All the false and negative statements were reversing coded prior to the analysis of the mean scores. Knowledge and societal attitudes item-mean scores, and frequencies (percentage) were calculated. First check the normality of the overall knowledge and societal attitude mean scores regarding ASD by using Kolmogorov-Smirnov test. The independent t-test was used to compare mean scores. A p-value of less than 0.05 was considered as significant.

## RESULTS

In this study, the mean knowledge and societal attitude scores of Autism Spectrum Disorder (ASD) were compared among medical students. A total of 449 participants were invited and response rate of study participants was 95.99%. The participants' ages ranged from 19 to 23 years, with an average age of 21.58±1.4. Among the participants, 296(68.7%) were female, while 135(31.3%) were male. An overwhelming 398(92%) of participants expressed that Autism Spectrum Disorder (ASD) should be formally incorporated into the medical training curriculum, also, there was high level of agreement as 425(98%) were in favor of allowing general public to attend educational sessions on ASD, as summarized in Table 1.

**Table 1: Demographic and Autism Spectrum Disorder (ASD) related information of study participants (n=431)**

| Characteristics | Frequency (n) |
|---|---|
| **Age (years)** | 21.58±1.40* |
| **Gender** | |
| Male | 135(31.3%) |
| Female | 296(68.7%) |
| **Year of study** | |
| First | 72(16.7%) |
| Second | 75(17.4%) |
| Third | 88(20.4%) |
| Fourth | 178(41.3%) |
| Fifth | 18(4.20%) |
| **Family member with autism** | |
| Yes | 56(13.0%) |
| **Gender of family member with autism** | |
| Female | 12(2.8%) |
| Male | 44(10.2%) |
| Not applicable | 375(87.0%) |
| **Have you attained any session about ASD** | |
| Yes | 69(16.0%) |
| **Should ASD be taught in medical programs?** | |
| Yes | 398(92.3%) |
| **Should general public be allowed to attend sessions on ASD?** | |
| Yes | 425(98.6%) |

*Mean± Std. Deviation

Table2 discussed the knowledge of participant regarding ASD, across various statements, with responses rated on a five-point Likert scale from "Strongly Disagree" to "Strongly Agree. A majority of participants 277(64.3%) agreed or strongly agreed that autism is a developmental disorder, with a mean score 3.62 ± 1.09, indicating moderate to high awareness of this fact. However, notable misconceptions were also identified, as 66.4% believed that vaccines increase autism risk (mean = 3.81 ± 1.02). There were mixed responses on the existence of a cure and effectiveness of universal interventions. While participants showed moderate awareness concerning genetic links with 43.6% agreeing, Nearly half of the participants acknowledged that autism can be diagnosed as early as 18 months of age (48.3%) and is more prevalent in males (45.7%).

A large majority 334(77.5%) recognized that autism affects people from all races, ethnicities, and socioeconomic backgrounds also a higher awareness was also observed in participants concerning core characteristics of autistic children, with 73.3% recognizing poor social and communication skills and 70.3% acknowledging resistance to changes in routine. Majority 312(72.4%) agreed about the importance of special education for these children. Mixed responses were observed on statement regarding diagnosis of ASD via blood and genetic test and on whether autism can be fatal over time. Participant also show mixed responses to whether one intervention is effective for all individuals.

**Table 2: Knowledge Toward Autism Spectrum Disorder (ASD) Responses Distribution n (%) and Mean ± SD Scores**

| Knowledge Regarding ASD | SD | D | N | A | SA | Mean± SD |
|---|---|---|---|---|---|---|
| Q1 | 23(5.3) | 51(11.8) | 80(18.6) | 190(44.1) | 87(20.2) | 3.62±1.09 |
| Q2 | 11(2.6) | 37(8.6) | 97(22.5) | 162(37.6) | 124(28.8) | 3.81±1.02 |
| Q3 | 26(6.0) | 88(20.4) | 168(39.0) | 103(23.9) | 46(10.7) | 3.13±1.04 |
| Q4 | 20(4.6) | 72(16.7) | 151(35.0) | 154(35.7) | 34(7.9) | 3.26±0.98 |
| Q5 | 8(1.9) | 64(14.8) | 151(35.0) | 164(38.1) | 44(10.2) | 3.40±0.92 |
| Q6 | 9(2.1) | 48(11.1) | 177(41.1) | 152(35.3) | 45(10.4) | 3.41±0.89 |
| Q7 | 40(9.3) | 154(35.7) | 149(34.6) | 62(14.4) | 26(6.0) | 2.72±1.01 |
| Q8 | 16(3.7) | 641(4.8) | 97(22.5) | 188(43.6) | 66(15.3) | 3.52±1.03 |
| Q9 | 19(4.4) | 92(21.3) | 150(34.8) | 119(27.6) | 51(11.8) | 3.21±1.04 |
| Q10 | 13(3.0) | 73(16.9) | 88(20.4) | 180(41.8) | 77(17.9) | 3.55±1.06 |
| Q11 | 3(0.7) | 28(6.5) | 88(20.4) | 214(49.7) | 98(22.7) | 3.87±0.86 |
| Q12 | 58(13.5) | 170(39.4) | 123(28.5) | 62(14.4 | 18(4.2) | 2.56±1.02 |
| Q13 | 3(.7) | 29(6.7) | 831(9.3) | 231(53.6) | 85(19.7) | 3.85±0.83 |
| Q14 | 2(.5) | 33(7.7) | 93(21.6) | 204(47.3) | 99(23.0) | 3.85±0.87 |
| Q15 | 20(4.6) | 87(20.2) | 110(25.5) | 150(34.8) | 64(14.8) | 3.35±1.10 |
| Q16 | 6(1.4) | 19(4.4) | 72(16.7) | 201(46.6) | 133(30.9) | 4.01±0.88 |
| Q17 | 38(8.8) | 91(21.1) | 149(34.6) | 119(27.6) | 34(7.9) | 3.05±1.07 |
| Q18 | 29(6.7) | 90(20.9) | 137(31.8) | 127(29.5) | 48(11.1) | 3.17±1.09 |
| Q19 | 51(11.8) | 132(30.6) | 135(31.3) | 88(20.4) | 25(5.8) | 2.78±1.08 |
| Q20 | 14(3.2) | 46(10.7) | 147(34.1) | 169(39.2) | 55(12.8) | 3.48±0.95 |

Q1. Are you aware that autism is a developmental disorder? (T): Q2.Do you think vaccines are causing an increase in autism? (F): Q3. Do you think autism is completely curable (F): Q4. Do autism runs in families (T): Q5. Can autism be diagnosed at earlier developmental stages as early as 18 months? (T): Q6. Do you think autism is more frequently observed in males than in females? (T): Q7. Do you believe changing a child's diet will lessen the severity of autism symptoms? (F): Q8. Do you think that all children with autism show poor eye contact? (F): Q9. Do you believe that same interventional approach can work for all children with autism? (F): Q10. Do you think children with autism can grow up to lead an independent life? (T): Q11. Do you believe that all children with autism must receive special educational services? (T): Q12. Do you think that with if the proper treatment is provided, most children with autism will eventually outgrow it? (F): Q13. Do you think that children with autism have poor social and communication skills? (T): Q14. Do you believe children with autism exhibit resistance to changes in daily routines? (T): Q15. Do you believe that unstable upbringing with lack of proper care is one of the causes of autism? (F): Q16. Do you believe that autism can affect people from every race, ethnic group and socioeconomic background? (T): Q17. Do you think autism can be diagnosed through blood and genetic testing? (F): Q18. Do you think autism can be fatal over time? (F): Q19. Do you believe autistic children can see or hear things that do not exist? (F): Q20. Do you believe that majority of children with autism have intelligence, average or above average? (F)

SD, strongly disagree; D, disagree; N, Neutral; A, agree; SA, strongly agree;

(F), were presented false statements; (T) were presented True statements

Table 3 revealed the participants responses toward the presence and rights of individuals with Autism Spectrum Disorder (ASD). Most of the participants 374(86.8%) and 384(89%) expressed that they were not afraid to be around someone with ASD and felt comfortable with an individual with ASD in their class respectively. A significant portion of participants 415(96.3%) were neutral or supportive of an ASD facility opening in their neighborhood, with a mean score 3.60 ± 0.69, While a substantial majority 324(75.2%) agreed that children with ASD should be fully integrated into mainstream classes with a mean score 4.02 ± 0.85. Responses were more reserved, as only 44.6% agree or strongly agree to show physical affection such as hugging towards ASD individual. A large number of respondents 234(54.3%) agree to the statement that ASD individual should go to college. A strong majority 364(84.5%) were agreed with the idea that individuals with ASD should engage in romantic relationships with a mean score 4.20 ± 0.75, and 334(77.5%) agreed they should marry individuals without ASD with mean score 4.10 ± 0.85. Among participants 332(77%), with a mean score of 4.07 ± 0.87 agreed that people with ASD can form relationships and express affection.

**Table 3: Societal Attitude Toward Autism Spectrum Disorder (ASD) Responses Distribution n (%) and Mean ± SD Scores**

| Societal Attitude | SD | D | N | A | SA | Mean± SD |
|---|---|---|---|---|---|---|
| Q1. | 2(0.5) | 9(2.1) | 46(10.7) | 184(42.7) | 190(44.1) | 4.28±0.77 |
| Q2. | - | 16(3.7) | 177(41.1) | 201(46.6) | 37(8.6) | 3.60±0.69 |
| Q3.* | - | 10(2.3) | 37(8.6) | 191(44.3) | 193(44.8) | 4.32±0.72 |
| Q4. | 38(8.8) | 57(13.2) | 144(33.4) | 180(41.8) | 12(2.8) | 3.16±0.99 |
| Q5.* | 4(0.9) | 29(6.7) | 164(38.1) | 234(54.3) | 4(0.9) | 4.46±0.66 |
| Q6. | 4(0.9) | 35(8.1) | 89(20.6) | 150(34.8) | 153(35.5) | 3.96±0.98 |
| Q7. | 4(0.9) | - | 63(14.6) | 203(47.1) | 161(37.4) | 4.20±0.75 |
| Q8. | 1(0.2) | 18(4.2) | 78(18.1) | 172(39.9) | 162(37.6) | 4.10±0.85 |
| Q9. | - | 26(6.0) | 73(16.9) | 176(40.8) | 156(36.2) | 4.07±0.87 |
| Q10.* | - | 23(5.3) | 84(19.5) | 186(43.2) | 138(32.0) | 4.02±0.85 |
| Q11. | 15(3.5) | 62(14.4) | 111(25.8) | 160(37.1) | 83(19.3) | 3.54±1.06 |
| Q12. | 7(1.6) | 75(17.4) | 102(23.7) | 145(33.6) | 102(23.7) | 3.60±1.07 |
| Q13. | 4(0.9) | 49(11.4) | 120(27.8) | 167(38.7) | 91(21.1) | 3.68±0.96 |
| Q14. | 2(0.5) | 47(10.9) | 111(25.8) | 142(32.9) | 129(29.9) | 3.81±1.00 |
| Q15. | 31(7.2) | 68(15.8) | 110(25.5) | 127(29.5) | 95(22.0) | 3.43±1.19 |
| Q16. | 21(4.9) | 42(9.7) | 126(29.2) | 157(36.4) | 85(19.7) | 3.56±1.06 |

Q1. Do you feel afraid to be around a person with ASD?: Q2. Would you feel comfortable living in a neighborhood where an Autism Spectrum Disorder (ASD) facility is located?: Q3.* Do you feel comfortable having a person with ASD as your classmate?: Q4. Do you feel comfortable to hug a person with ASD?: Q5.* Do you think individuals with ASD should go to college?: Q6. Do you believe it is acceptable for individuals with Autism Spectrum Disorder (ASD) to have children?: Q7. Do you believe it is acceptable for individuals with Autism Spectrum Disorder (ASD) to engage in romantic relationships?: Q8. Do you believe it is acceptable for individuals with Autism Spectrum Disorder (ASD) to marry individuals without ASD?: Q9. Do you believe individuals with Autism Spectrum Disorder (ASD) can form relationships and express affection?: Q10.* Should children with Autism Spectrum Disorder (ASD) be fully integrated into mainstream classrooms?: Q11. Do you believe that individuals with Autism Spectrum Disorder (ASD) are capable of living independently?: Q12. Do you believe autistic individuals can understand other people's feelings?: Q13. Do you agree that a person with Autism Spectrum Disorder (ASD) is not a financial burden to their family?: Q14. Do you agree that students with ASD attending mainstream regular classrooms are not a distraction to students without ASD in that classroom?: Q15. Do you think individual with ASD is not an emotional burden to his/her family?: Q16. Do you agree that people with Autism Spectrum Disorder (ASD) should not be institutionalized for their safety and the safety of others?

SD, strongly disagree; D, disagree; N, Neutral; A, agree; SA, strongly agree;

*were presented positive statements

The mean knowledge and societal attitude scores of ASD did not significantly differ between male and female participants. The t-tests yielded p-values of (p=0.88 & p=0.33), respectively. Participants with a family member diagnosed with autism had slightly higher mean knowledge scores (3.43 ± 0.19) compared to those without (3.37 ± 0.20); however, this difference was not statistically significant (p = 0.080). In contrast, societal attitude scores showed a significant difference (p < 0.001), with participants who had a family member with autism reporting higher mean scores (3.91 ± 0.44).However, there wasn't any significant difference observed in knowledge or societal attitude mean score between participants with male versus female family members with autism p-values (p=0.78 & p=0.85), respectively. There was no significant difference were assessed in knowledge scores noted based on attendance at an educational session on ASD (p = 0.56). However, societal attitude of ASD showed a significant difference (p = 0.005), with those who had attended ASD sessions scores were higher mean score 4.01±0.4 than those who had not mean score 3.83±0.49 (Table 4).

**Table 4: Comparing the Mean Knowledge and Societal Attitude Scores Between Demographic and Autism Spectrum Disorder (ASD) Related Factors**

| **Autism Spectrum Disorder (ASD)** | **Knowledge** | | **Societal Attitude** | |
|---|---|---|---|---|
| **Demographic and ASD factors** | **Mean± SD** | P-value | **Mean±SD** | P-value |
| **Gender** | | | | |
| Female | 3.37±0.26 | 0.88 | 3.87±0.49 | 0.33 |
| Male | 3.38±0.23 | | 3.82±0.48 | |
| **Family member with autism** | | | | |
| No | 3.37±0.26 | 0.08 | 3.51±0.62 | <0.001 |
| Yes | 3.43±0.19 | | 3.91±0.44 | |
| **Gender of family member with autism (n=56)** | | | | |
| Female | 3.45±0.19 | 0.78 | 3.48±0.68 | 0.85 |
| Male | 3.43±0.19 | | 3.52±0.61 | |
| **Have you attained any session about ASD** | | | | |
| No | 3.38±0.26 | 0.56 | 3.83±0.49 | 0.005 |
| Yes | 3.36±0.24 | | 4.01±0.43 | |
| **Should ASD be taught in medical programs?** | | | | |
| No | 3.29±0.23 | 0.08 | 3.73±0.38 | 0.13 |
| Yes | 3.38±0.25 | | 3.87±0.49 | |

## DISCUSSION

The present study assessed knowledge and societal attitudes toward Autism Spectrum Disorder (ASD) among medical students in Karachi, Pakistan. Overall, the data suggest a moderate level of knowledge that was not significantly influenced by demographic factors such as gender or exposure-related variables like knowing someone with ASD or attending related sessions. Although students with a family member with autism exhibited slightly higher knowledge scores, this difference was not statistically significant.

Notably, many participants were unaware that autism can be diagnosed as early as 18 months. Knowledge of genetic links and the higher

prevalence among males was moderate. However, most students correctly identified key symptoms such as limited eye contact, social and communication difficulties, and resistance to changes in routine. A significant proportion also recognized the importance of special education services for children with autism. These findings suggest that while students possess functional knowledge of behavioral traits and support needs, there is a gap in understanding autism's broader cognitive and sensory dimensions. Curriculum enhancements could help bridge this gap.

The findings of this study resonate with those from other research conducted internationally and regionally, highlighting both similarities and distinctions in autism knowledge among medical students. The results from study conducted in Pakistan to evaluate the knowledge and awareness of childhood autism among healthcare professionals evidenced that among all respondents' medical students exhibited comprehensive knowledge regarding male predominance, etiology, method of diagnosis and available treatment options for autism [32]. In another cross-sectional study among fourth year medical students from public and private medical universities of Karachi, researchers found that mean knowledge score was 12.30±4.71 out of 25, indicating a moderate understanding of ASD [33]. Similarly the study conducted in Mumbai revealed insufficient knowledge among final-year medical students, particularly regarding the age of onset and certain diagnostic traits, such as staring into space, lack of interest in surroundings, fixation on routines, and atypical eating habits. Despite these gaps, students in the Mumbai study demonstrated awareness of key features like impaired language development, poor eye contact, and challenges in social interaction, which align with the strengths observed in the current study. The overall score was 11.85 out of 19 in the Mumbai study, participants in this research demonstrated basic awareness but still showed room for improvement in understanding more nuanced diagnostic features and early detection [32]. The multicenter study among medical students of Palestine [29] showed insufficient knowledge about autism, particularly concerning its symptoms, diagnostic characteristics, and treatment options. This was reflected in the students' low median familiarity scores on the subject. This contrasts with findings from the United States, where third-year medical students demonstrated significantly higher knowledge than the general population ($p < 0.001$)

Notably, the U.S. study compared the knowledge levels of medical students with those of the general population and found that medical students had significantly higher knowledge across all surveyed areas ($p < 0.001$). However, despite their stronger knowledge base, the students displayed a low level of confidence in applying this knowledge in practice. The higher than the general knowledge levels observed in the current study, which might reflect differences in curriculum emphasis, exposure to ASD-related content, or cultural and regional variations in autism awareness initiatives [32].

The knowledge levels observed in this study are comparable to findings from other research conducted among medical students at Qasim University in Saudi Arabia reported that 55.5% of participants demonstrated good knowledge regarding ASD and most of them exhibited positive attitude which is slightly higher than the general knowledge levels observed in the current study [33]. Physicians often identify insufficient knowledge and a lack of confidence as major barriers to providing effective care for children with autism. Additionally, studies reveal gaps in medical training: U.S. medical students report inadequate preparation in treating autistic children, while their counterparts in the UK express low confidence in managing the care and referral processes for both children and adults with ASD [28-33].

A major challenge in addressing Autism Spectrum Disorder (ASD) is the issue of delayed diagnosis. Early identification and intervention are crucial, as research consistently shows that intensive, evidence-based early interventions can significantly improve the communication and behavioral challenges faced by young children with ASD. Enhancing knowledge

about autism can lead to earlier recognition and timely interventions, ultimately improving outcomes for children with ASD.

International research involving both medical doctors and medical students highlights a significant gap in medical training related to autism spectrum disorder (ASD), particularly in developing countries. These studies underscore the need for more robust and comprehensive ASD education within medical curricula to equip future healthcare providers with the necessary knowledge and skills. The findings emphasize that while some foundational awareness exists, the lack of specialized training in many regions hampers the ability to address the complexities of ASD diagnosis and management effectively. Strengthening ASD-related education globally is critical to bridging this gap, especially in resource-constrained settings.

*Limitations:* The study only included medical students from a specific institution, which may limit the generalizability of the findings. The results may not reflect the knowledge or societal attitudes of medical students in other regions of country. In addition, the study relied on self-reported measures to assess knowledge and perceptions of ASD, which may introduce response bias. Students may overestimate their knowledge or provide socially desirable responses rather than an accurate reflection of their true understanding. Furthermore, the study focused on specific aspects of ASD knowledge and societal attitudes, which may not encompass the full range of information necessary for comprehensive understanding, including interventions, support systems, or specific cultural perspectives that are key aspects of ASD.

## CONCLUSION

The findings of this study strongly support the need for mandatory training and awareness programs on autism spectrum disorder (ASD) in medical college to improve the ability of future practitioners to identify and manage ASD in clinical practice. Such initiatives are essential for ensuring early and effective intervention. Furthermore, there is a clear need to increase exposure to individuals with ASD during medical training. Providing medical students with more opportunities to interact with ASD patients will not only deepen their understanding but also boost their confidence in managing ASD cases. These findings underscore the importance of integrating ASD-related content and patient interaction into medical curricula to better prepare students for real-world clinical scenarios. The study calls for further research and development of strategies to enhance ASD education and practice.

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**Authors' Contribution**

BZ: Manuscript writing, interpretation of data and final approval of manuscript

AA: Concept & design, statistical analysis, editing of manuscript, responsible for integrity of research. FJ, TA, ZK, RH, HZ: Data collection and final approval of manuscript.

## REFERENCES:

1. American Psychiatric Association. Understanding mental disorders: Your guide to DSM-5-TR®. American Psychiatric Pub; 2023. DOI: https://doi/book/10.1176/appi.books 9780890425787
2. Lord C, Brugha TS, Charman T, Cusack J, Dumas G, Frazier T,et al. Autism spectrum disorder. Nature Reviews Diseas Primer. 2020; 6(1):5. DOI: 10.1038/s41572-019-0138-4.
3. Bai D, Yip BH, Windham GC, Sourander A, Francis R, Yoffe R, et al. Association of genetic and environmental factors with autism in a 5-

country cohort. JAMA psychiat. 2019;76(10): 1035-1043. DOI: https://doi.org/ 10.1001/ jamapsychiatry.2019.1411.
4. Emberti Gialloreti L, Mazzone L, Benvenuto A, Fasano A, Garcia Alcon A, Kraneveld A, et al. Risk and protective environmental factors associated with autism spectrum disorder: evidence-based principles and recommendations. J Clin Med. 2019;8(2):217-219. DOI: https:// doi.org/10.3390/jcm8020217.
5. Muhle RA, Reed HE, Stratigos KA, Veenstra-VanderWeele J. The emerging clinical neuroscience of autism spectrum disorder: a review. JAMA psychiatry. 2018;75(5):514-523. DOI: https://doi.org/10.1001/jamapsychiatry. 2017.4685.
6. Lyall K, Song L, Botteron K, Croen LA, Dager SR, Fallin MD, et al. The Association Between Parental Age and Autism-Related Outcomes in Children at High Familial Risk for Autism. Autism Res. 2020;13(6):998-1010. DOI: https://doi.org/10.1002/aur.2303.
7. Yenkoyan K, Mkhitaryan M, Bjørklund G. Environmental Risk Factors in Autism Spectrum Disorder: A Narrative Review. Curr Med Chem. 2024;31(17):2345-2360. DOI: https://doi.org/ 10.2174/0109298673252471231121045529.
8. Zeidan J, Fombonne E, Scorah J, Ibrahim A, Durkin MS, Saxena S, et al. Global prevalence of autism: A systematic review update. Autism Res. 2022;15(5):778-790. DOI: http://doi.org/ 10.1002/aur.2696.
9. Chiarotti F, Venerosi A. Epidemiology of Autism Spectrum Disorders: A Review of Worldwide Prevalence Estimates Since 2014. Brain Sci. 2020;10(5):274. DOI: https://doi.org/10.3390/ brainsci10050274.
10. Qiu S, Lu Y, Li Y, Shi J, Cui H, Gu Y, et al. Prevalence of autism spectrum disorder in Asia: A systematic review and meta-analysis. Psychiatry Res. 2020;284(1):112679. DOI: https://doi.org/ 10.1016/j.psychres.2019.112679.
11. Furrukh J, Anjum G. Coping with autism spectrum disorder (ASD) in Pakistan: A phenomenology of mothers who have children with ASD. Cogent psychol. 2020;7(1):1728108. DOI: https://doi.org/10.1080/23311908.2020. 1728108.
12. Volkmar RF, Jackson LJS. Core dimensions of autism spectrum disorders. In J. R. Geddes, N. C. Andreasen, & G. M. Goodwin (Eds.), New Oxford Textbook of Psychiatry. Oxford University Press. 2020: 239–245. DOI: https://doi.org/10.1093/med/9780108713005.0 01.0001.
13. Lord C, Elsabbagh M, Baird G, Veenstra-Vanderweele J. Autism spectrum disorder. Lancet. 2018;392(10146):508-520. DOI: http:// doi.org/10.1016/S0140-6736(18)31129-2.
14. Brignell A, Morgan AT, Woolfenden S, Klopper F, May T, Sarkozy V, et al. A systematic review and meta-analysis of the prognosis of language outcomes for individuals with autism spectrum disorder. Autism Dev Lang Impairments. 2018. DOI: http://doi.org/10.1177/2396941518767610.
15. Hyman SL, Levy SE, Myers SM, Kuo DZ, Apkon S, Davidson LF, et al. Identification, evaluation, and management of children with autism spectrum disorder. Pediatrics. 2020; 145(1):1-6. DOI: https://doi.org/10.1542/peds. 2019-3447.
16. Van't Hof M, Tisseur C, van Berckelear-Onnes I, Van Nieuwenhuyzen A, Daniels AM, Deen M, et al. Age at autism spectrum disorder diagnosis: a systematic review and meta-analysis from 2012 to 2019. Autism. 2021;25:862–73. DOI: https://doi.org/10.1177/ 1362361320971107.
17. Lopez-Espejo MA, Nuñez AC, Moscoso OC, Escobar RG. Clinical characteristics of children affected by autism spectrum disorder with and without generalized hypotonia. Eur J Pediatr. 2021;180(10):3243-3246. DOI: https:// doi.org/ 10.1007/s00431-021-04038-7.
18. Eseigbe EE, Nuhu FT, Sheikh TL, Eseigbe P, Sanni KA, Olisah VO. Knowledge of Childhood Autism and Challenges of Management among Medical Doctors in Kaduna State, Northwest Nigeria. Autism Res Treat. 2015;2015(1):892301. DOI: http://doi.org/10.1155/2015/892301.
19. Atun-Einy O, Ben-Sasson A. Pediatric allied healthcare professionals' knowledge and self-

efficacy regarding ASD. Res Autism Spectr Disord. 2018;47(1):1-3. DOI: https://doi.org/1016/j.rasd.2017.12.001
20. Alyami HS, Naser AY, Alyami MH, Alharethi SH, Alyami AM. Knowledge and Attitudes toward Autism Spectrum Disorder in Saudi Arabia. Int J Environ Res Public Health. 2022;19(6):3648-3650. DOI: https://doi.org/10.3390/ijerph19063648.
21. Yi H, Siu QKY, Ngan OMY, Chan DFY. Parents' experiences of screening, diagnosis, and intervention for children with autism spectrum disorder. Am J Orthopsychiatry. 2020;90(3):297-311. DOI: http://doi.org/10.1037/ort0000433.
22. Hodges H, Fealko C, Soares N. Autism spectrum disorder: definition, epidemiology, causes, and clinical evaluation. Transl Pediatr. 2020;9(1):55-65. DOI: https://doi.org/10.21037/tp.2019.09.09.
23. Brookman-Frazee L, Stadnick N, Chlebowski C, Baker-Ericzén M, Ganger W. Characterizing psychiatric comorbidity in children with autism spectrum disorder receiving publicly funded mental health services. Autism. 2018;22(8):938-952. DOI: https://doi.org/10.1177/1362361317712650.
24. Davignon MN, Qian Y, Massolo M, Croen LA. Psychiatric and Medical Conditions in Transition-Aged Individuals With ASD. Pediatric. 2018;141(4):335-345. DOI: http://doi.org/10.1542/peds.2016-4300K.
25. Smith GS, Fleming M, Kinnear D, Henderson A, Pell JP, Melville C, et al. Mortality in 787,666 school pupils with and without autism: A cohort study. Autism. 2021;25(1):300-304. DOI: https://doi.org/10.1177/1362361320944037.
26. Forsyth L, McSorley M, Rydzewska E. All-cause and cause-specific mortality in people with autism spectrum disorder: A systematic review. Res Autism Spectr Disord. 2023;105(1):102165. DOI: https://doi.org/10.1016/j.rasd.2023.102165.
27. Zerbo O, Massolo ML, Qian Y, Croen LA. A Study of Physician Knowledge and Experience with Autism in Adults in a Large Integrated Healthcare System. J Autism Dev Disord. 2015;45(12):4002-14. DOI: https://doi.org/10.1007/s10803-015-2579-2.
28. Austriaco K, Aban I, Willig J, Kong M. Contemporary Trainee Knowledge of Autism: How Prepared Are Our Future Providers? Front Pediatr. 2019;7(1):165-169. DOI: https://doi.org/10.3389/fped.2019.00165.
29. Shawahna R, Jaber M, Yahya N, Jawadeh F, Rawajbeh S. Are medical students in Palestine adequately trained to care for individuals with autism spectrum disorders? A multicenter cross-sectional study of their familiarity, knowledge, confidence, and willingness to learn. BMC Med Educ. 2021;21(1):424-428. DOI: https://doi.org/10.1186/s12909-021-02865-8.
30. Rakap S, Balikci S, Kalkan S, Aydin B. Knowledge of autism spectrum disorder among the general population in Turkey: implications for public training and education. Intl J Disabil Dev Educ. 2022;69(2):565-577. DOI: https://doi.org/10.1080/1034912X.2020.1719047.
31. Low HM, Zailan F. Medical students' perceptions, awareness, societal attitudes and knowledge of autism spectrum disorder: an exploratory study in Malaysia. Int J Dev Disabil. 2016;64(2):86-95. DOI: http://doi.org/10.1080/20473869.2016.1264663.
32. Noor NA, Talha MU, Ahmad SA, Mohydin MA, Shah SS, Mohydin SH, et al. Evaluation of the prevalence of childhood autism awareness amongst medical professionals in Pakistan. Consultant. 2021;1(1):1-0. DOI: https://doi.org/10.53350/pjmhs211561356.
33. Shaukat F, Fatima A, Zehra N, Hussein MA, Ismail O. Assessment of knowledge about childhood autism among medical students from private and public universities in Karachi. J Pak Med Assoc. 2014;64(11):1331-1334. DOI: https://europepmc.org/article/med/25831662.

**ORIGINAL ARTICLE**

# SERO PREVALENCE OF HIV, HCV, HBV AND SYPHILIS (VRDL) IN TRANSGENDER MALE SEX WORKERS FROM RURAL, URBAN SINDH AND PUNJAB, PAKISTAN

Muhammad Rizwan[1*], Khurram Jah Siddique[2], Muhammad Uzair[3], Samiyah Tasleem[4], Khursheed Hashmi[5]

## ABSTRACT

**Objectives:** Sexually transmitted infections (STIs) are among the most important health concerns in sex workers and the related key population because of the interaction of this community with general population and their spouses, as this group acts as a bridge between themselves and the people they come in intimate contact with. In Pakistan it can impact more profoundly because of lower literacy rate, poor personal and sexual hygiene. The estimated literacy rate of 62.3% for Sindh, 66.25 (both urban and rural) necessitates initiatives that focus public awareness programs research activities to further emphasize upon the magnitude of the problem.

**Methods:** A prospective study was conducted by infection control and prevention society of Pakistan to highlight the fact by evaluating the seroprevalence of HIV, HCV, HBV & VDRL in transgender, male sex workers (TGMSW) from different regions of Sindh and Punjab.

**Results:** During an 11months period a total of 1198 TGMSW were assessed for the presence of HIV, HBV, HCV and VRDL from 1$^{st}$ January 2023 to 30$^{th}$ November 2023. Our findings with the limited data set has revealed a total of 139 (31%) test subjects to be positive for HIV, 113 (25%) individuals were found to be infected with HBV, 54 (12%) infected with HCV and 145 (32%) were found positive with VDRL. In addition to single infections, the study also examined the occurrence of coinfections. Results showed 9 individuals with HBV and HCV, 10 with HIV and Syphilis, and 4 with each combination: HIV-HCV and HIV-Syphilis. Only 1 case of HIV-HBV was observed.

**Conclusion:** The present study reports an overall incidence of HIV 31%, HBV 25%, HCV 12% and VDRL 32% which is suggestive of immediate need to further investigate these infections with large scale population-based study to reveal more accurate magnitude of the problem.

**Keywords:** Sexually Transmitted Infections (STIs), Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV) & Hepatitis C virus (HCV), Syphilis, Transgender Male Sex Workers (TGMSW)

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## INTRODUCTION

Sexually Transmitted Infections (STIs) are infections that could occur from person to person via direct unprotected sexual contact or unhygienic sex with infected persons via vaginal, anal, and oral routes [1]. STIs are primarily spread by male, female and transgender sex workers or people who frequently have multiple partners. STIs remain a significant public health concern because of the associated serious health consequences such as infertility [2], adverse pregnancy outcomes [3], chances of various benign and malignant neoplasms involving genitals / pelvic organs and there is always a higher risk of acquiring Human Immunodeficiency Virus (HIV) along with other bacterial and viral STIs in adult population all around the world [4-6] the chances of acquiring STIs increases many fold in underdeveloped world due to lack of access to awareness related to personal hygiene and sexual health. Acquiring sexual gratification by having intimate contact with female and male sex workers or even transgenders is a persistent phenomenon in many parts of the world. In Pakistan sex before marriage or having multiple partners is usually considered uncommon but over a period of time people have become habituated. The lower literacy rate among sex workers is contributing to the rising incidence of STIs. The present study aimed to focus the magnitude of the problem by estimating the prevalence of the top four STIs namely HIV, Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Syphilis [7]. Among these four STIs, Human immunodeficiency virus HIV infection is of great concern. At the end of 2023 approximately 39.9 million people were living with HIV. This represents about 0.6% of adults aged 15 – 49 years worldwide. Among people living with HIV (PL-HIV) 630,000 died of HIV [8] . Globally syphilis remains a significant public health concern. In 2022, an estimated 8 million adults aged 15- 49 years acquired syphilis. Additionally, syphilis in pregnancy, if untreated or inadequately treated, leads to adverse pregnancy outcomes in 50- 80% of cases, including stillbirths and neonatal deaths [9].

Current data from 187 countries shows that viral hepatitis is a major public health challenge of this decade. An estimated 1.3 million people died from chronic viral hepatitis B and hepatitis C in 2022 which amounts to 3500 death/day [10, 11]. It has been recorded that almost 254 million are living with hepatitis B and another 50 million are infected as of 2022 worldwide. An alarming figure is of 6000 newly diagnosed cases every day worldwide [12]. Keeping in view these epidemiological figures, infection control society conducted this study from different cities of Sindh and Punjab provinces to find out the exact prevalence of these STIs.

## METHODOLOGY

Ethical approval was obtained from Pakistan Medical Research Organization. Inclusion criteria involve male transgender sex workers, currently engaged in sex work for more than six months and age 14 - 60 years. Exclusion criteria involve diagnosis of cases of HIV, HBV, HCV, or Syphilis, persons taking antibiotics in last two weeks and severe acute illness, cognitive impairment. The study was conducted from January 1$^{st}$ to 30$^{th}$ November 2023 using snowball technique. Total of 1198 Transgender Male Sex Workers (TGMSW) were recruited and investigated for the presence of HIV, HBV, HCV or Syphilis. The whole blood sample was collected aseptically using vacutainer in 5 cc gel tube and centrifuged serum was separated and stored in 1.5 ml Cryogenic vials.

**HIV Detection:** Determine™ HIV-1/2 AG/AB combo was used for the detection of HIV 1/ 2 antigens that can identify four different antigen P17 p24 Gp120 and Gp41 while at the same time this system detected antibodies against all four antigens. Detection of HIV was based on a three-test strategy described by World Health Organizations (WHO) to avoid misdiagnosis of HIV as it has serious social and psychological implications. According to the three-test strategy, one must confirm using the three tests shown in the chart above to report any new HIV cases. To identify and report HIV infections, only a competent and trained staff person is allowed.

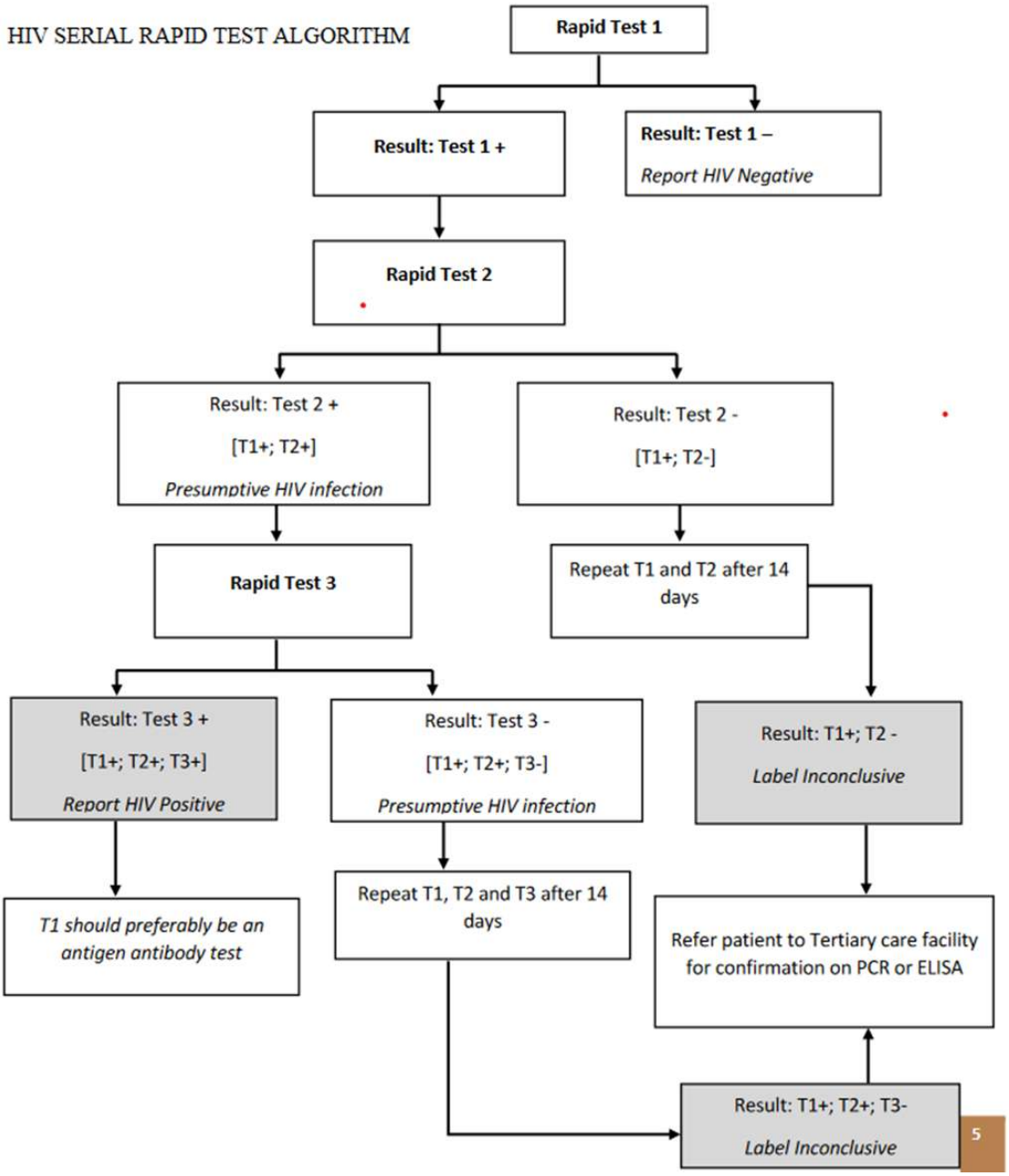


**Figure: HIV Serial RAPID Tests Algorithm**

The three-test strategy was used as a criterion to report HIV infections and only confirmed case of HIV were included in the present study. Hepatitis B Surface Antigen (HbsAg): Determine $^{TM}$ HbsAg2 (Abbot) was used for the detection of HbsAg as per instructions of the provider. Anti-Hepatitis C Virus Antibodies (Anti-HCV): Acon Anti-HCV antibody detection cassette was used to detect antibodies against HCV. VDRL detection: CTK biotech's Syphilis Ab Combo was used for Treponema pallidum (Tp) antibodies.

## RESULTS

The observed frequency of STIs in different regions of the selected localities is summarized in Table 1. From a total of 1198 screened 145 (32%) were positive for VDRL. Mirpurkhas was found most effected region of Sindh as 28 cases out of 110 belong to that region. Second most affected area was Karachi with 22 positive cases out of 201 (15%) and while in Sangher the infectivity for syphilis was observed to be 10% as 15 out of 62 subjects were infected. The cumulative incidence HIV was 31% as 139 new cases out of 1198 were identified. Mirpurkhas was once again found to take a lead in terms of infection as most HIV infected area is Mirpurkhas as 30 subjects out of 110 (22%) tested positive for HIV, secondly 14% positivity was from Karachi & Thar parker each where out of 205-19 & 105-19 were HIV infected respectively. While Tando Allah yar, Ghotki, Sangher and Hyderabad each contributed 6% where 36-8, 43-9 ,62-9 and 59-9 individuals were positive respectively. The total identified cases of HBV were 113 out of 1196 (25%). The rate of infectivity in descending order is as follows: Thar parker 21 out of 105(25%), Karachi 15 out of 201(13%), Shirkarpur 14 out of 59(12%).

**Table 1: Summary of STIs in Different Regions of the Selected Localities**

| SUMMARY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sr No. | City | Total Cases | HBsAg | | HIV Antibody | | HCV Ab | | VDRL | |
| | | | Positive | Negative | Positive | Negative | Positive | Negative | Positive | Negative |
| 1 | Badin | 50 | 6 | 44 | 3 | 47 | 2 | 48 | 6 | 44 |
| 2 | Dadu | 85 | 2 | 83 | 5 | 80 | 4 | 81 | 6 | 79 |
| 3 | Ghotki | 43 | 0 | 43 | 9 | 34 | 0 | 43 | 5 | 38 |
| 4 | Hyderabad | 59 | 5 | 54 | 9 | 50 | 1 | 58 | 7 | 52 |
| 5 | Jaccobabad | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 6 | Jamshoro | 19 | 0 | 19 | 4 | 15 | 0 | 19 | 2 | 17 |
| 7 | Kamber | 14 | 2 | 12 | 0 | 14 | 2 | 12 | 1 | 13 |
| 8 | Kandhkot | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| 9 | Karachi | 201 | 15 | 186 | 19 | 182 | 5 | 196 | 22 | 179 |
| 10 | kashmore | 26 | 5 | 21 | 0 | 26 | 2 | 24 | 1 | 25 |
| 11 | Khairpur | 31 | 9 | 22 | 2 | 29 | 9 | 22 | 4 | 27 |
| 12 | Larkana | 20 | 2 | 18 | 0 | 20 | 2 | 18 | 0 | 20 |
| 13 | Matiari | 26 | 3 | 23 | 1 | 25 | 0 | 26 | 1 | 25 |
| 14 | Mirpur | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 |
| 15 | Mirpurkhas | 110 | 7 | 103 | 30 | 80 | 3 | 107 | 28 | 82 |
| 16 | N.Feroz | 10 | 1 | 9 | 3 | 7 | 0 | 10 | 0 | 10 |
| 17 | Okara | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 18 | Pakpattan | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 4 |
| 19 | Rawalakot | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 20 | S.B.A | 26 | 3 | 23 | 2 | 24 | 0 | 26 | 3 | 23 |
| 21 | Sanghar | 62 | 1 | 61 | 9 | 53 | 4 | 58 | 15 | 47 |
| 22 | Sheikupura | 31 | 0 | 31 | 1 | 30 | 0 | 31 | 0 | 31 |
| 23 | Shikarpur | 59 | 14 | 45 | 5 | 54 | 1 | 58 | 7 | 52 |
| 24 | Sukkur | 39 | 5 | 34 | 0 | 39 | 0 | 39 | 7 | 32 |
| 25 | T.Allah Yar | 36 | 4 | 32 | 8 | 28 | 5 | 31 | 5 | 31 |
| 26 | T.M Khan | 38 | 0 | 38 | 0 | 38 | 3 | 35 | 1 | 37 |
| 27 | Tharparkar | 105 | 21 | 84 | 19 | 86 | 7 | 98 | 11 | 94 |
| 28 | Thatta | 28 | 2 | 26 | 1 | 27 | 0 | 28 | 2 | 26 |
| 29 | Umerkot | 69 | 6 | 63 | 7 | 62 | 4 | 65 | 10 | 59 |
| | **TOTAL** | **1198** | **113** | **1085** | **139** | **1059** | **54** | **1144** | **145** | **1053** |

The distribution of HCV was overall 12% among the test subjects. Khairpur had the highest rate of infection whereas 09 subjects out 31 tested positive (29%) followed by Tando Allahyar 5 out of 36 (14%) Thar parker 3 out of 38(13%) (table 1).

In addition to analyzing the prevalence of single infections, the current study also identifies the co-existence of all the four studied infectious agents and following bar chart is representing the co-infections (Figure 2). 10 cases of HIV were co-infected with syphilis. Furthermore, syphilis co-infection with HCV was observed in a total number of 08 cases whereas each combination had a breakdown of 04 cases.

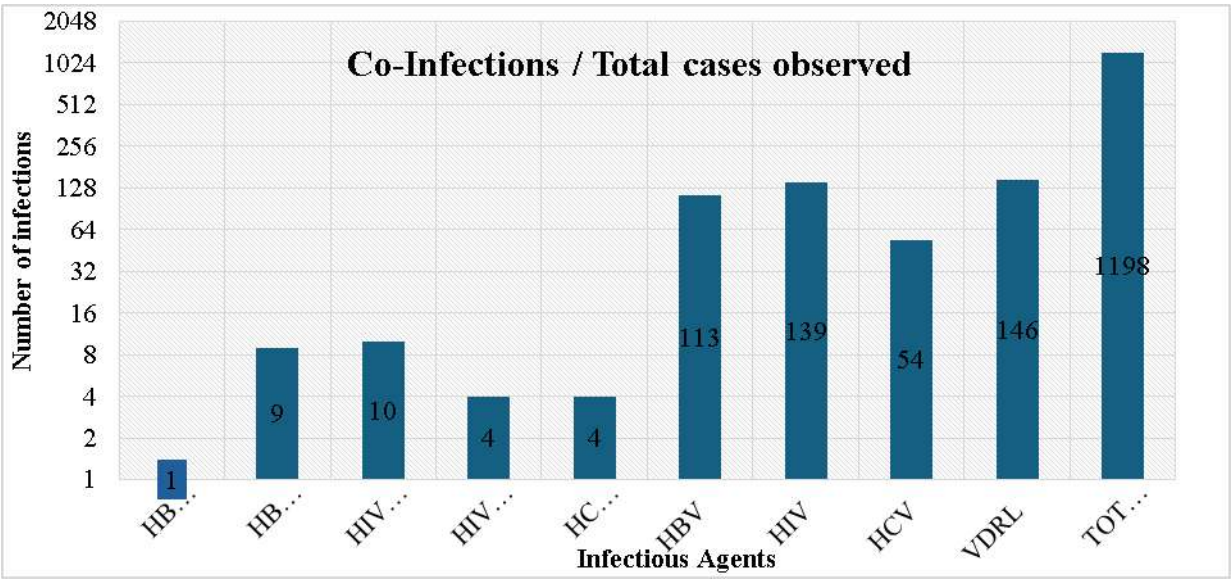


**Figure 2: Co-existence of Infectious Agents**

To establish the existence of significant positive or negative association in the context of age-related trends of infections, Chi-Square test was performed using SPSS version 26. Three different age groups were defined as 11-20,21-30 and 31-40. Significant positive association has been observed in both viral hepatitis B and C according to the statistics, signifying that the number of infections increases with advancing age whereas no relation has been observed for HIV and Syphilis (table 2).

**Table 2: Age-related Trends of Infections**

| INFECTIONS | HCV | HIV | VDRL | HBV |
|---|---|---|---|---|
| **Age Groups** | % Pos. | % Pos. | % Pos. | % Pos. |
| **1(11-20)** | 12.5%(11) | 11.4%(10) | 12.5% (11) | 19.3(17) |
| **2(21-30)** | 3.1% (23) | 12%(88) | 12.1% (89) | 7.2(53) |
| **3(30-40)** | 5.3 % (20) | 10.9%(41) | 12.2%(46) | 11.4(43) |
| **Total Count** | 4.5% (54) | 11.%(139) | 12.2%(146) | 9.4(113) |
| **P Values** | 0.001 | 0.854 | 0.995 | 0.001 |

## DISCUSSIONS

The incidence of STDs among TGMSW was determined to be 32% Syphilis, 31% HIV, 25% Hepatitis B, and 12% Hepatitis C throughout selected areas of Sindh and Punjab. 1198 TGMSW were included to determine the presence of forementioned STIs. Large scale studies are required to fully disclose the actual incidence of STIs with reference to the exact population of transgenders in these cities as the present study only reveals data of the selected participants gathered using snowball technique, but anyhow computed statistics were sufficient to demonstrate the scope of this health issue. The top three affected regions in terms of syphilis infectivity were Mirpurkhas (19% positive), Karachi (15%), and Sangher (10%). However, a recent study that examined 1120 participants from four major Sindh cities Karachi, Hyderabad, Sukkar, and Larkana revealed that 96 (16.29%) of the 598 participants had syphilis, and 40 (6.79%) of those cases had syphilis coinfected with HIV.[13]. A similar study involving five major areas of Sindh and Punjab observed an incidence of Syphilis even more lower (3.26%) in men who have sex with men (MSM) and transgenders, 82 out of 2531 (3.2%) were found to be infected [14]. Additionally, a different small-scale study that involved transgender sex workers discovered that 77 out of 208 (37%) of the participants had syphilis [15]. These discrepancies in observations strongly imply that the precise facts and statistics can only be revealed by a large-scale population-based study. It is possible to cure syphilis. It might be one of the causes of the observational fluctuations in the previously stated research.

According to the statistics of the study the Mirpurkhas was the most HIV-affected area (22%), Karachi and Thar parker were next with 14% each, followed by Hyderabad, Ghotki, Sanger, and Tando Allahyar, with 6% each respectively. As per statistics of the 2020 Global AIDs monitoring report, 7.1% of transgender male sex workers from all over Pakistan had HIV infection, and a noteworthy increase has been noted in the number of HIV-related deaths [16]. With a small sample size, the current study has found that there is a marked increased incidence of HIV in TGMSW from Sindh alone. A related study by the Punjab AIDS Control program focused on the prevalence of HIV, HBV, HCV and Syphilis among transgenders. It examined 1,562 transgenders and found 280 infected with HIV, 288 HCV positive cases, 600 cases of syphilis and 99 HBV infections. Further, this study discovered that out of 280 HIV-positive individuals 177 (63.2%) had co-infection with syphilis, 87 (31%) co-infected with HCV, and 47 (16.8%) co-infected with HBV [17] Similar research conducted in Rawalpindi, Pakistan, with 306 transsexual men revealed a notably elevated prevalence of HIV1 as evidenced by PCR validation, revealing that 21.6% (Confidence Interval 0.17-0.26) of the participants were HIV positive [18]. Furthermore, a more recent study conducted on female sex workers (FSWs) from rural and urban Sindh revealed, 121 out of 5660 (2.1%) FSWs who were newly infected HIV [19]. Comparably, a recent meta-analysis of 25 studies from 11 different nations revealed that transgender women showed an overall positivity rate of 0% to 49.6% while transgender men showed an overall positivity rate of 0% to 8.3% [20]. Moreover, a meta-analysis conducted in the United States, combining information from eighty-eight studies revealed, HIV infection prevalence among transwomen and transmen were 14.1% and 3.2%, respectively [21]. In the present study the hepatitis B viral infection rates in the top three cities, Tharparkar, Karachi and Shirkarpur was 19%, 13%, and 12% respectively. The incidence of hepatitis C viral infections was highest in Khairpur at 17%, Tharparkar at 13%, while Karachi and Sanghar each had 9%. A study conducted in Rawalpindi, Pakistan, revealed an overall 25.5% incidence of HCV 78 out of 306 TGSW, of them had HCV while 83 % of the individual claimed they had safe sexual activities [22].

## RECOMMENDATIONS

The following measures are highly recommended.

1. **Education and awareness:** We should conduct targeted awareness campaigns about sexually

transmitted infections (STIs) their transmission and prevention methods. Promote safe sex practices, including the consistent use of condoms.

2. **Access to healthcare:** Another approach is to have access to healthcare. Accessible healthcare facilities should be established, offering STI testing, treatment and counselling. Free or subsidized vaccinations for hepatitis B should be provided.
3. **Community engagement:** Collaborations with local organizations and community leaders can reduce stigma and discrimination. Trained healthcare providers can also offer non-judgmental and inclusive care.
4. **Behavioral interventions:** Peer education programs can be implemented to encourage healthy behavior within these communities. Harm reduction services for injectable drug users (IDUs) is also a sensible approach.
5. **Monitoring and research:** Conduct regular surveillance to trace infection rates and identify high risk areas. Invest in research to understand the unique challenges faced by these populations.

## CONCLUSION

The purpose of this study was to evaluate the seroprevalence of HIV, HCV, HBV, and VDRL among TGMSW in different regions of Sindh, Pakistan. A sizable proportion of tested TGMSW were found infected with at least one as well as a few tested positives for dual infections. To address the spread of these infections a multifaceted approach is essential.

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**Authors' Contribution**

MR: Concept & design, statistical analysis, manuscript writing, responsible for integrity of research.

KJS, MU: data collection and manuscript writing
ST, KH: edited, review and final approval of manuscript

## REFERENCES

1. Garcia MR, Leslie SW, Wray AA. Sexually transmitted infections. 2020. Weblink: https://pubmed.ncbi.nlm.nih.gov/32809643/.
2. Tsevat DG, Wiesenfeld HC, Parks C, Peipert JF. Sexually transmitted diseases and infertility. American J Obstetric Gynecol. 2017;216(1):1-9. DOI: https://doi.org/10.1016/j.ajog.2016.08.008.
3. Tsega NT, Abebe B, Ebabu T, Asmare T, Kassa M, Haile TT, et al. Sexually transmitted infections and associated factors during pregnancy in Gondar city, Northwest Ethiopia, 2021: a multicenter study. Clin Epidemiol Glob Healt. 2022;16(1):101096. DOI: https://doi.org/10.1016/j.cegh.2022.101096.
4. Otu A, Danhoundo G, Toskin I, Govender V, Yaya S. Refocusing on sexually transmitted infections (STIs) to improve reproductive health: a call to further action. Springer. 2021:1-4. DOI: https://doi.org/10.1186/s12978-021-01296-4.
5. Workowski KA, Berman SM. Centers for Disease Control and Prevention sexually transmitted disease treatment guidelines. Clin Infectious Dis. 2011;53(3):59-63. DOI: https://doi.org/10.1093/cid/cir694.
6. Srinivas M, Wong NS, Wallace R, Emch M, Tang W, Yang EJ, et al. Sexually transmitted infection rates and closure of family planning clinics because of abortion restrictions in Iowa. JAMA Network Open. 2022;5(10):e2239063-e. DOI: 10.1001/jamanetworkopen.2022.39063.
7. Hussen S, Tadesse BT. Prevalence of syphilis among pregnant women in sub-Saharan Africa: a systematic review and meta-analysis. BioMed Res Int. 2019;2019. DOI: https://doi.org/10.1155/2019/4562385.
8. Lewin SR, Attoye T, Bansbach C, Doehle B, Dubé K, Dybul M, et al. Multi-stakeholder consensus on a target product profile for an HIV cure. The Lancet HIV. 2021;8(1):e42-e50. DOI: 10.1016/S2352-3018(20)30234-4.
9. Syphilis. Available at: https://www.who.int/news-room/fact-sheets/detail/syphilis. [Last accessed on 2025 May 29].
10. Cui F, Blach S, Mingiedi CM, Gonzalez MA,

Alaama AS, Mozalevskis A, et al. Global reporting of progress towards elimination of hepatitis B and hepatitis C. Lancet Gastroenterol Hepatol. 2023;8(4):332-42. DOI: 10.1016/S2468-1253(22)00386-7.
11. Razavi-Shearer D, Gamkrelidze I, Pan C, Jia J, Berg T, Gray R, et al. Global prevalence, cascade of care, and prophylaxis coverage of hepatitis B in 2022: a modelling study. Lancet Gastroenterol Hepatol. 2023;8(10):879-907. DOI: 10.1016/S2468-1253(23)00197-8.
12. Organization. WH. Available at: [Last accessed on 2025 Apr 9].
13. Shah SA, Zubair M, Soomro A, Sheikh R, Zhamalbekova A, Abidi SH. Analysis of seroprevalence and risk factors for syphilis and HIV among female sex workers and transgender individuals in different cities of Sindh, Pakistan. PloS One. 2025;20(1):e0312683. DOI: https://doi.org/10.1371/journal.pone.0312683.
14. Osama M. O08. 4 Rate of sti among selected msm and transgenders in 5 cities of pakistan. 2017: A18-A18. DOI: https://doi.org/10.1136/sextrans-2017-053264.45.
15. Baqi S, Shah SA, Baig MA, Mujeeb SA, Memon A. Seroprevalence of HIV, HBV and syphilis and associated risk behaviours in male transvestites (Hijras) in Karachi, Pakistan. Int J STD & AIDS. 1999;10(5):300-304. DOI: https://doi.org/10.1258/0956462991914159.
16. Garcia SA, Chen J, Calleja JG, Sabin K, Ogbuanu C, Lowrance D, et al. Availability and quality of surveillance and survey data on HIV prevalence among sex workers, men who have sex with men, people who inject drugs, and transgender women in low-And middle-income countries: Review of available data (2001-2017). JMIR Pub Healt Surveillanc. 2020;6(4):e21688. DOI: 10.2196/21688.
17. Javed H, Bano A, Fatima W, Khan R, Akhtar A. Sexually transmitted infections and associated risk factors among the transgender population of Pakistan. BMC Infectious Dis. 2023;23(1):618-623. DOI: https://doi.org/10.1186/s12879-023-08591-4.
18. Akhtar H, Badshah Y, Akhtar S, Kanwal N, Akhtar MN, Zaidi NUSS, et al. Prevalence of human immunodeficiency virus infection among transgender men in Rawalpindi (Pakistan). Virology J. 2012;9(1):1-9. DOI: https://doi.org/10.1186/1743-422X-9-229.
19. Emmanuel F, Achakzai BK, Reza T. Prevalence and factors associated with HIV epidemic among female sex workers in Pakistan: results of the fifth round of integrated biological and behavioural surveillance. Sexually Transmitt Infect. 2021;97(6):446-51. DOI: http://orcid.org/0000-0002-7901-0257.
20. Van Gerwen OT, Jani A, Long DM, Austin EL, Musgrove K, Muzny CA. Prevalence of sexually transmitted infections and human immunodeficiency virus in transgender persons: a systematic review. Transgender Healt. 2020;5(2):90-103. DOI: https://doi.org/10.1089/trgh.2019.0053.
21. Becasen JS, Denard CL, Mullins MM, Higa DH, Sipe TA. Estimating the prevalence of HIV and sexual behaviors among the US transgender population: a systematic review and meta-analysis, 2006–2017. Americ J Pub Healt. 2019;109(1):e1-e8. DOI: https://doi.org/10.2105/AJPH.2018.304727
22. Akhtar H, Badshah Y, Akhtar S, Hassan F, Faisal M, Qadri I. Prevalence of hepatitis B and hepatitis C Virus infections among male to female (MFT) transgenders in Rawalpindi (Pakistan). Advancements in Life Sci. 2018;5(2):46-55. DOI: https://doi.org/ 10.1016/j.ajog.2016.08.008.

**ORIGINAL ARTICLE**

# IMPACT OF MODE OF DELIVERY ON MENSTRUAL HYGIENE IN POSTPARTUM PERIOD

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**ABSTRACT:**

**Objectives:** To assess the relationship between sociodemographic factors and reproductive health indicators, including place and mode of delivery, menstrual hygiene, and past contraceptive use among women attending a local hospital.

**Methods:** This cross-sectional study involved 200 women visiting a Jam Ghulam Qadir Government Hospital, Hub. Data were collected on educational background, socio-economic status (SES), mode and place of delivery, use of IUCD/surgery, menstrual hygiene practices (pad/cloth use), and hygiene status.

**Results:** Most participants were either uneducated (42.5%) or had primary to intermediate education (47%). A majority belonged to the poor class (55%). Normal vaginal delivery was reported in 75%, while 25% had cesarean sections. Hospital deliveries were more common (62.5%) than home births (37.5%). IUCD/surgical contraceptive history was reported in 32.5% of participants. Menstrual hygiene practices showed 45% used cloths, while 55% used pads. Hygiene status was reported as satisfactory in 56% of participants.

**Conclusion:** The mode of delivery significantly influences menstrual hygiene practices during the postpartum period. Women who undergo cesarean sections often face greater challenges in maintaining optimal menstrual hygiene due to restricted mobility, postoperative discomfort, and delayed initiation of self-care practices. In contrast, women who deliver vaginally generally resume routine hygiene practices more swiftly.

**Keywords**: Delivery Practices, Menstrual Hygiene, Women's Health

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## INTRODUCTION

Women's health, particularly reproductive health, is a multifaceted domain influenced by a complex interplay of sociodemographic factors, healthcare access, and personal hygiene practices [1]. Understanding these interactions is crucial for devising effective healthcare strategies and interventions aimed at improving women's overall well-being. Socioeconomic status, education, and hygiene practices are key determinants that can significantly impact reproductive health outcomes, including the choice of delivery method, menstrual hygiene management, and the utilization of contraceptive methods [2]. The intricate relationship between these factors necessitates a comprehensive examination to identify specific areas where targeted interventions can yield the most significant positive impact [3]. Menstrual hygiene management encompasses the practices and products employed by women and girls to maintain hygiene during menstruation, including the use of menstrual products, personal hygiene routines, and waste

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disposal methods [4]. Access to appropriate menstrual hygiene products, such as sanitary pads, and clean water and sanitation facilities are essential components of effective menstrual hygiene management. Globally, inadequate menstrual hygiene management poses significant health and socioeconomic challenges, particularly in low-resource settings, underscoring the importance of addressing these disparities to promote women's health and empowerment. Menstrual health and hygiene are increasingly recognized as integral to public health, driving research into the provision of menstrual materials and interventions that supply reusable and disposable options [5].

Recent studies have emphasized the role of integrated community-based health programs in addressing both maternal care and menstrual hygiene needs, especially in underprivileged regions. A 2023 Lancet Commission report on women's health stresses the need for including policies that go beyond biological aspects and consider structural determinants, including gender inequity, poverty, and education [6]. Additionally, emerging research highlights the mental health burden associated with poor menstrual hygiene and inadequate childbirth care, suggesting that addressing these issues holistically is critical for sustainable improvements in women's health outcomes [7].

## METHODOLOGY

This was a cross-sectional, observational study conducted at a Jam Ghulam Qadir Govt Hospital Hub. A non-probability convenience sampling technique was employed to recruit participants over a January 2024-December 2024. Women were approached in the hospital waiting area, informed about the study, and those providing verbal consent were included.

A total of 200 women of reproductive age (15–49 years), attending the hospital for routine consultations or minor complaints, were recruited for this study. Inclusion criteria involved: women willing to participate, having a history of at least one delivery, and ability to understand and respond to a structured questionnaire

Women with severe illness, cognitive impairment, or unwilling to provide consent were excluded from the study. A structured questionnaire was developed by the research team based on literature review and expert opinion. It was pilot tested on 20 participants (not included in final analysis) to assess clarity and comprehensiveness. The questionnaire was administered via face-to-face interviews conducted in the local language. The data collection tool included several sections. The sociodemographic data section captured information on participants' age, educational status (categorized as uneducated, primary, matric, intermediate, bachelor, or master), and socioeconomic status (classified as poor, middle class, or upper class). The obstetric and reproductive history section included details on the mode of delivery (normal vaginal delivery or cesarean section), place of delivery (hospital or home), and any past history of intrauterine contraceptive device (IUCD) use or sterilization surgery. The menstrual hygiene practices section assessed the type of material used during menstruation (cloths or sanitary pads) and general hygiene status, which was rated as satisfactory or unsatisfactory based on participants' self-reported frequency of bathing, hand washing, and genital hygiene. Lastly, the tool included other parameters, such as sleep patterns or disturbances, if such data were available in the full dataset. Data were compiled using Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 23.0. Descriptive statistics, including frequencies and percentages, were used to summarize categorical variables such as educational status, socioeconomic class, and hygiene practices. Results were presented using tables and graphical figures (e.g., bar charts, pie charts) to improve clarity and interpretability.

## RESULTS

A substantial proportion of the participants were having non-formal education, accounting for 42.5% of the total sample. Among those who had received formal education, 14.5% had completed primary school, 17.5% had studied up to the metric level, and 15% had attained intermediate education. Higher education levels were less commonly observed, with only 7.5% holding a bachelor's degree and a mere 3% having completed a master's degree. This distribution indicates that a majority of the women had limited formal education, which may affect their awareness and utilization of health services. In terms of socio-economic status, the data revealed that more

than half of the women (55%) belonged to the poor class, reflecting limited financial means and potentially restricted access to quality healthcare, hygiene facilities, and educational resources. The middle class made up 35% of the participants, while only 10% were classified as upper class (Table 1).

**Table 1: Frequency of Education and Socio-Economic Status among the females visiting hospital**

| Characteristics | | Normal (200) | |
|---|---|---|---|
| | | n | % |
| Education | Non-formal | 85 | 42.5 |
| | Primary | 29 | 14.5 |
| | Metric | 35 | 17.5 |
| | Intermediate | 30 | 15 |
| | Bachelor | 15 | 7.5 |
| | Masters | 06 | 3 |
| Socio-Economic Status | Poor class | 110 | 55 |
| | Middle class | 70 | 35 |
| | Upper Class | 20 | 10 |

The majority (75%) reported having undergone a normal vaginal delivery, while the remaining 25% had delivered via cesarean section. Regarding the place of delivery, 62.5% of the women gave birth in a hospital setting, indicating relatively good access to institutional healthcare services, whereas 37.5% delivered at home, which may reflect traditional practices or limited access to healthcare facilities. When asked about their history of contraceptive procedures such as intrauterine contraceptive device (IUCD) use or surgical sterilization, 32.5% of participants responded affirmatively, while 67.5% had no such history. This suggests a moderate uptake of long-term contraceptive methods within the sample population. Menstrual hygiene practices showed a near-equal distribution, with 55% of women reporting the use of sanitary pads and 45% using cloths during menstruation (Table 2).

**Table 2: Distribution of Obstetric, Contraceptive, and Menstrual Hygiene Parameters among Normal Participants**

| Parameters | | Normal (n=200) | |
|---|---|---|---|
| | | n | % |
| Mode of delivery | Normal | 150 | 75 |
| | C-Section | 50 | 25 |
| Place of delivery | Hospital | 125 | 62.5 |
| | Home | 75 | 37.5 |
| Intrauterine contraceptive device (IUCD) /Surgery | Yes | 65 | 32.5 |
| | No | 135 | 67.5 |
| Pad/cloths usage | Cloths | 90 | 45 |
| | Pads | 110 | 55 |
| Hygiene Status | Satisfactory | 112 | 56 |
| | Unsatisfactory | 88 | 44 |

## DISCUSSION

The findings of this study underscore the intricate interplay between sociodemographic factors and key reproductive health indicators among women accessing care at a local hospital, revealing a compelling narrative of disparities and unmet needs [8]. The observed preponderance of participants with limited formal education, with a significant 42.5% reporting no schooling and 47% attaining only primary to intermediate levels, highlights a critical barrier to accessing and comprehending essential health information, which subsequently impacts their reproductive health choices and practices [9]. This is further compounded by the economic vulnerabilities faced by the majority (55%) of the study population, classified as belonging to the poor socioeconomic stratum, which constrains their access to quality healthcare services, nutritious food, and adequate sanitation, all of which are fundamental determinants of reproductive well-being [10]. These socioeconomic disadvantages create a cyclical pattern, where limited education leads to fewer economic opportunities, which in turn restricts access to healthcare and reinforces poor reproductive health outcomes.

The predominance of normal vaginal deliveries (75%) among the study participants aligns with global trends, where vaginal delivery remains the preferred mode due to its lower risk profile and cost-effectiveness. However, the 25% cesarean section (C-section) rate observed exceeds the World Health Organization's recommended threshold of 10–15%, suggesting potential overuse or medical necessity that warrants further investigation. Studies have indicated that higher C-section rates are often associated with urban settings, increased maternal education, and better access to healthcare facilities.

Regarding the place of delivery, 62.5% of women delivered in hospital settings, reflecting relatively good access to institutional healthcare services. This is consistent with findings from Mozambique, where institutional deliveries were more common among women with higher education levels and urban residency. However, the 37.5% of home deliveries highlight persistent barriers, such as cultural preferences, financial constraints, or limited access to healthcare facilities, especially in rural areas. Similar challenges have been documented in Tanzania, where distance to health facilities and lack of transportation were significant factors influencing home deliveries [11].

The uptake of long-term contraceptive methods, with 32.5% of participants reporting the use of intrauterine contraceptive devices (IUCDs) or undergoing surgical sterilization indicates moderate utilization. This is comparable to findings in various low- and middle-income countries, where contraceptive use is influenced by factors such as education, socioeconomic status, and access to healthcare services. Enhancing awareness and accessibility of family planning services remains crucial for improving reproductive health outcomes [12].

Menstrual hygiene practices among participants showed that 55% used sanitary pads, while 45% relied on cloths during menstruation. This near-equal distribution underscores ongoing challenges in menstrual hygiene management (MHM), particularly in resource-limited settings. A study conducted in South-west Delhi found that good menstrual hygiene practices were significantly associated with higher education levels and socioeconomic status. Similarly, research in rural Pakistan highlighted that inadequate MHM practices were more prevalent among women with lower education and income levels. These findings emphasize the need for targeted interventions to improve MHM, including education, affordable sanitary products, and improved sanitation facilities [13,14].

## CONCLUSION

The mode of delivery significantly influences menstrual hygiene practices during the postpartum period. Women who undergo cesarean sections often face greater challenges in maintaining optimal menstrual hygiene due to restricted mobility, postoperative discomfort, and delayed initiation of self-care practices. In contrast, women who deliver vaginally generally resume routine hygiene practices more swiftly. These differences highlight the need for tailored postpartum education and support, particularly for women recovering from surgical births, to ensure adequate menstrual hygiene management and prevent associated health complications.

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**Author's Contributions:**
NH: Concept, design, writing and responsible for integrity of research.
MDV: Final approval of manuscript
UN: Data collection and manuscript writing
SN: Edited, Reviewed
MA: statistical analysis, editing of manuscript, responsible for integrity of research.

**REFERENCES**

1. Boutib A, Chergaoui S, Marfak A, Hilali A, Youlyouz-Marfak I. Quality of life during pregnancy from 2011 to 2021: systematic review. Int J Womens Healt. 2022;14:975–005. DOI: 10.2147/IJWH.S361643.
2. Rezaei N, Tavalaee Z, Sayehmiri K, Sharifi N, Daliri S. The relationship between quality of life and methods of delivery: a systematic review and meta-analysis. Electron Physician. 2018;10(4):6596–607. DOI: 10.19082/6596.
3. Galle A, Moran AC, Bonet M, Graham K, Muzigaba M, Portela A, et al. Measures to assess quality of postnatal care: a scoping review. PLoS Glob Public Healt. 2023;3(2):e0001384. DOI: 10.1371/journal.pgph.0001384.
4. Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. BMJ Glob Healt. 2021;6(6):e005671. DOI: 10.1136/bmjgh-2021-005671.
5. Eyi EGY, Mollamahmutoglu L. An analysis of the high cesarean section rates in Turkey by Robson classification. J Matern Fetal Neonatal Med. 2021;34(16):2682–92. DOI: 10.1080/14767058.2019.1670806.
6. Suwanrath C, Chunuan S, Matemanosak P, Pinjaroen S. Why do pregnant women prefer cesarean birth? A qualitative study in a tertiary care center in Southern Thailand. BMC Pregnancy Childbirt. 2021;21(1):23-29. DOI: 10.1186/s12884-020-03525-3.
7. Martínez-Galiano JM, Hernández-Martínez A, Rodríguez-Almagro J, Delgado-Rodríguez M. Quality of life of women after giving birth: associated factors related with the birth process. J Clin Med. 2019;8(3):324-329. DOI: 10.3390/jcm8030324.
8. Hernandez Alava M, Pudney S, Wailoo A. The EQ-5D-5L value set for England: findings of a quality assurance program. Value Healt. 2020;23(5):642–648. DOI: 10.1016/j.jval.2019.10.017.
9. Angelini CR, Pacagnella RC, Parpinelli MA, Silveira C, Andreucci CB, Ferreira EC, et al. Quality of life after an episode of severe maternal morbidity: evidence from a cohort study in Brazil. Biomed Res Int. 2018;2018:9348647. DOI: 10.1155/2018/9348647.
10. Evans K, Fraser H, Uthman O, Osokogu O, Johnson S, Al-Khudairy L. The effect of mode of delivery on health-related quality-of-life in mothers: a systematic review and meta-analysis. BMC Pregnancy Childbirt. 2022;22(1):149. DOI: 10.1186/s12884-022-04473-w.
11. Triviño-Juárez JM, Romero-Ayuso D, Nieto-Pereda B, Forjaz MJ, Criado-Álvarez JJ, Arruti-Sevilla B, et al. Health related quality of life of women at the sixth week and sixth month postpartum by mode of birth. Women Birth. 2017;30(1):29–39. DOI: 10.1016/j.wombi.2016.06.005.
12. Prick BW, Bijlenga D, Jansen AJ, Boers KE, Scherjon SA, Koopmans CM, et al. Determinants of health-related quality of life in the postpartum period after obstetric complications. Eur J Obstet Gynecol Reprod Biol. 2015;185(1):88–95. DOI: 10.1016/j.ejogrb.2014.11.038.
13. Priddis H, Schmied V, Dahlen H. Women's experiences following severe perineal trauma: a qualitative study. BMC Womens Health. 2014;14(1):32. DOI: 10.1186/1472-6874-14-32.
14. Kolu P, Raitanen J, Luoto R. Physical activity and health-related quality of life during pregnancy: a secondary analysis of a cluster-randomised trial. Matern Child Health J. 2014;18(9):2098–105. DOI: 10.1007/s10995-014-1457-4.

**ORIGINAL ARTICLE**

# PREVALENCE AND PROTECTIVE FACTORS OF SUICIDAL IDEATION AMONG MEDICAL STUDENTS IN KARACHI: THE IMPACT OF RELIGIOUS BELIEFS AND SOCIAL SUPPORT

Syed Muhammad Azhar Hussain[1*], Humaira Sharif[2], Syeda Kubra Kishwar Jafri[3], Maryum Aziz[4], Areeba Nadeem[5], Syeda Khaula Fatima[6], Syeda Masuma Naqvi[7], Noor ul Huda[8]

## ABSTRACT

**Objectives:** Suicidal ideation, a precursor to suicide attempts, poses a significant risk to individuals, particularly among medical students. Despite its importance, research on suicidal ideation among medical students in developing countries, including Pakistan, remains limited. The aim of study is to find prevalence and protective factors of suicidal ideation among medical students in Karachi.

**Methods:** Conducted between 2017 and 2018, this study surveyed undergraduate medical students from three institutions in Karachi, Pakistan. Data were collected through a questionnaire, and analysis was performed using Statistical Package for Social Sciences (SPSS) software. The study assessed the prevalence of suicidal ideation and identified associated factors such as academic pressure, relationship issues, social isolation, and financial difficulties. Additionally, the role of religion, family support, and friend networks in mitigating suicidal ideation was examined.

**Results:** Among 522 undergraduate medical students surveyed, 161 (31.0%) reported experiencing suicidal ideation. Factors contributing to suicidal ideation included academic burden, relationship issues, lack of social engagement, adjustment difficulties, and financial constraints. However, religiosity emerged as a protective factor, with religion serving as a significant deterrent against suicidal thoughts. Moreover, strong familial and social support networks played a crucial role in alleviating suicidal ideation among students.

**Conclusion:** This study identified study burden as a significant risk factor for suicidal ideation. Notably, emotional support from family members and friends was found to be a predominant protective factor, alleviating the suicidal thoughts. In contrast, religious beliefs did not exhibit a substantial impact on coping with suicidal ideation.

**Key words:** Suicidal Ideation, Suicide, Medical students, Karachi.

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## INTRODUCTION

Suicide is a global public health concern, claiming the lives of approximately 800,000 individuals worldwide every year, equating to one person every 40 seconds. Moreover, suicide attempts far outnumber completed suicides, making it a significant issue across populations. Particularly alarming is the prevalence of suicide among young people, with it being the second leading cause of death among 15-29 year olds globally. Medical students, undergoing rigorous training and facing intense academic and personal pressures, are not immune to the mental health challenges associated with suicide risk. Constant stress, including academic

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workload, social isolation, clinical demands, and competitive environments, contribute to heightened vulnerability among this population. While many students successfully navigate these challenges, some may struggle to cope, increasing their risk of depression and suicidal ideation. Moreover, studies have indeed documented that stress levels increase over the course of medical school, peaking either in the second year [1] or when students enter the medical wards as students encounter real-life patient care and the associated responsibilities [2].

Research conducted in various countries sheds light on the multifaceted nature of suicidal ideation among medical students after facing significant mental health challenges. Various factors contributing to increased suicidal ideation among this population. Substance abuse, including elevated rates of alcohol and drug use, has been strongly linked to heightened suicidal thoughts [3]. Furthermore, psychiatric disorders such as depression and anxiety are common, with a substantial number of students experiencing these issues throughout their medical education [4,5]. The chronic stress associated with the rigorous demands of medical training exacerbates these mental health struggles, often leading to suicidal ideation [3].

Cultural factors can also play a significant role in either heightening or alleviating mental health risks among medical students. In some regions, such as the UAE, higher levels of religiosity are thought to offer a protective effect against suicidal thoughts, potentially due to the moral and communal support structures provided by religious practices [6]. Similarly, strong social networks are essential, as they provide emotional support and can buffer the impact of stress and mental health challenges, ultimately reducing suicidal ideation [7]. Together, these intersecting factors of substance abuse, mental health disorders, chronic stress, and cultural influences underscore the complex landscape of mental health among medical students.

Suicidal ideation is recognized as a significant risk factor for suicide attempts and completions. While it is the most prevalent of all suicidal behaviors, only a minority of individuals with suicidal ideation engage in overt self-harm [8]. Understanding the factors contributing to suicidal ideation among medical students is crucial for developing targeted interventions and support systems to promote mental health and well-being in this vulnerable population. Among medical students, suicidal ideation is often precipitated by anxiety and stress related to the competitiveness of medical education and feelings of inadequacy. Additional factors include adjustment problems, financial issues, unemployment, family and relationship problems, and sexual abuse. The rigorous academic demands on medical students, which leave little time for relaxation or leisure, further exacerbate their vulnerability.

More than 720,000 people die by suicide every year, making it a major global health concern. It is the third leading cause of death among 15–29-year-olds, with 73% of cases occurring in low- and middle-income countries with a higher incidence in males (10.5) compared to females (4.1). Medical students, subjected to continuous stress due to academic pressures, social life deprivation, clinical stress, sleep deprivation, competition, and peer pressure, are particularly at risk of depression and suicidal ideation [9].

A study conducted on Pakistani students in 2014 found that 35.6% of 331 students had experienced suicidal ideation in the past year, with 13.9% having planned suicide and 4.8% having attempted it. Substance abuse, parental neglect, and psychiatric disorders are significant risk factors [10]. Research in Poland highlighted the link between chronic stress, anxiety, and suicidal thinking among medical students, who coped using music, sports, and social interactions [11]. In China, second-year medical students exhibited higher suicidal ideation rates than first-years, with socioeconomic background and sleep disorders being notable risk factors. Depression strongly correlated with suicidal ideation, with 30% of depressed students reporting such thoughts. According to a study conducted in china, around 5.9 % of students have tried to commit a suicide [12].

In Serbia, previous suicide attempts and depression correlated with GPA, age, relationship status, gender, mental illness, and drug use [13]. A study in western Nepal indicated that family-related issues were the primary cause of suicidal ideation among 10% of the study population [14]. Cultural factors influenced suicidal ideation rates in Turkish and Austrian students, with higher lifetime ideation in Austrians but more suicide attempts in Turks [15]. Conversely, the prevalence of suicidal ideation among UAE medical students was low, attributed to religiosity and strong social support. Lifetime suicidal ideation was reported by 17.5%, and attempts by 1.8% of the 115 medical students studied [16].

This study aims to determine the frequency of suicidal ideation among Karachi medical students, examine the impact of medical school admission on their mental health, identify key risk factors, assess available support systems, and explore attitudes towards seeking professional help. This study aimed to address the significant gap in research regarding the prevalence of suicidal ideation among medical students in Karachi, Pakistan. Further, to understand the contributing risk factors and the protective factors which help them to cope with such cases.

## METHODOLOGY

This study employed a cross-sectional descriptive design to determine the frequency of suicidal ideation among medical students in Karachi, targeting MBBS students enrolled in three medical institutes: Jinnah Medical and Dental College, Jinnah Sindh Medical University, and Liaquat College of Medicine and Dentistry, from January 1st, 2017, to October 31st, 2017. It employs a non-probability convenience sampling, including all MBBS students from the mentioned institutes from first year to final year who provided informed consent and were capable of understanding and responding to the questionnaire. The exclusion criteria comprise students not currently enrolled in MBBS program, those from other disciplines, like Dentistry, Pharmacy, and Nursing, students with cognitive or language impairment, and individual who declined consent. This approach ensured a focused sample of MBBS students, enabling the exploration of suicidal ideation and its correlates within this specific population. Data analysis was performed using SPSS software version 21.0.

To estimate the sample size, a finite population correction and a 95% confidence interval were applied, resulting in an estimated sample size of 384 using OpenEpi. The researchers designed a questionnaire consisting of both open and close-ended questions related to suicidal thoughts, risk factors of suicidal ideation, and the extent of support available to the students during their suicidal phases. The researchers personally visited each medical college/university to obtain research approval and distribute the questionnaires, which included consent forms, during lunch and tea breaks. In total, 151 students from JMDC, 246 from JSMU, and 125 from LCMD participated, with most participants being 3rd and 4th-year students as others were on semester breaks.

Our questionnaire incorporated items that inquired about symptoms of anxiety, depression, and sadness, which were based on established criteria for these conditions. Students' responses to those questions were used to estimate the prevalence of these emotional states and their association with suicidal ideation. Questionnaire used in present study was designed to capture relevant aspects of these conditions as they relate to suicidal thoughts. The collected data were then entered and analyzed using Statistical Package for Social Sciences (SPSS) version 21.0, with descriptive analyses performed and frequencies calculated. Ethical considerations were strictly followed; permission was obtained from all institutions before the study, and consent was obtained from the students via a consent form accompanying the questionnaire. The data collected were used solely for research purposes; ensuring privacy was maintained throughout the study.

## RESULTS

In our study, 522 undergraduate medical students from both government and private medical colleges in Karachi were included. The socio-demographic characteristics of the study sample are shown in Table 1. The majority of participants were from

Jinnah Sindh Medical University (47.1%), followed by Jinnah Medical and Dental College (28.9%) and Liaquat College of Medicine and Dentistry (23.9%). Most students were in their 4th year (65.0%), with a predominance of females (76.1%) over males (23.9%). Monthly family income varied, with 50.3% of students reporting an income of over Rs. 100,000.

**Table 1: Sociodemographic Characteristics of Study Participants (n= 522)**

| Characteristics | n % |
|---|---|
| Institute | |
| JMDC | 151(28.9) |
| JSMU | 246 (47.1) |
| LCMD | 125 (23.9) |
| Year | |
| 1st | 3 (0.6) |
| 2nd | 2 (0.4) |
| 3rd | 137 (27.7) |
| 4th | 321 (65.0) |
| 5th | 31 (6.3) |
| Gender | |
| Male | 113 (23.9) |
| Female | 360 (76.1) |
| Monthly Family Income (Rs.) | |
| <50,000 | 56 (12.6) |
| 50,000-1,00,000 | 165 (37.1) |
| >1,00,000 | 224(50.3) |

A significant portion of students, 392 (75.5%), reported experiencing feelings of sadness, depression, or anxiety at various times in their lives. To cope with these feelings, they adopted various strategies, which are detailed in Figure 1.

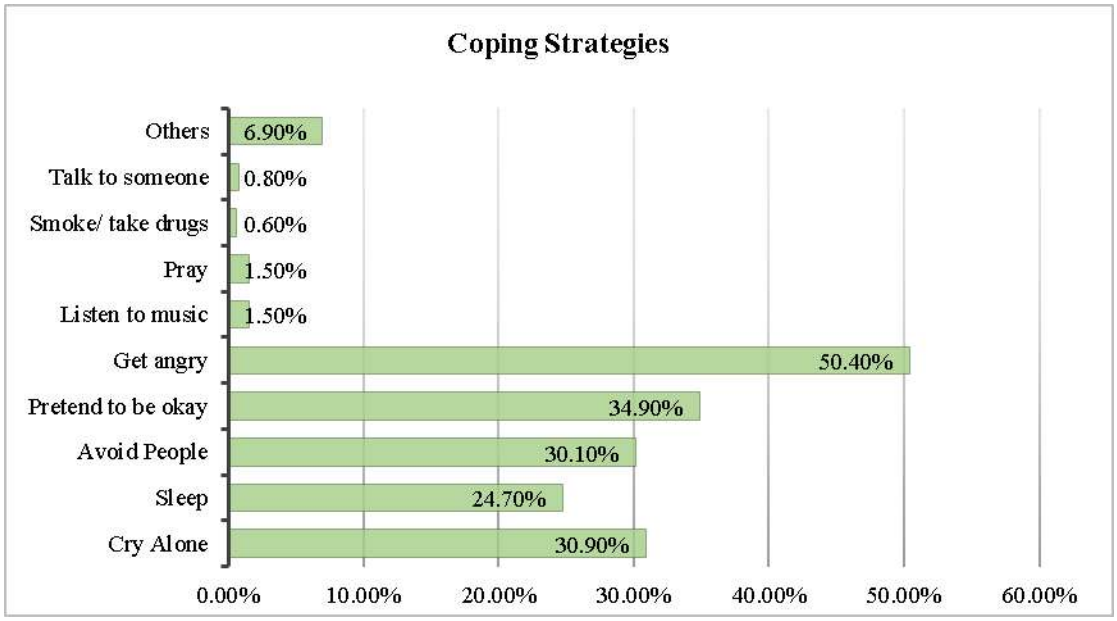


**Figure 1: Coping Strategies Used by Students**

Out of the total responses, 161 (31.0%) reported having suicidal ideation at some point in their life, with 72 (44.7%) of these individuals experiencing an increase in such thoughts since they first occurred. The frequency of suicidal thoughts among participants is outlined in Table 2.

**Table 2: Frequency of Suicidal Thoughts Among Medical Students**

| Frequency of suicidal thoughts among students | n % |
|---|---|
| Once a Year | 67 (13.8) |
| Once Month | 36 (7.4) |
| Once a Week | 18 (3.7) |
| Daily | 5 (1.0) |

Of the 522 students, 67(13.8%) were those having suicidal thoughts once a year. Moreover, 72 (13.9%) acknowledged having suicidal ideation before starting medical school, while 91 (17.6%) reported experiencing suicidal ideation for the first time after beginning their medical studies. Additionally, more students, 84 (16.3%), reported an increase in suicidal ideation after starting medical school, whereas it decreased for 33 (6.4%) and remained the same for 42 (8.2%). The most common issues leading to an increase in suicidal ideation among the participants are illustrated in Figure 2.

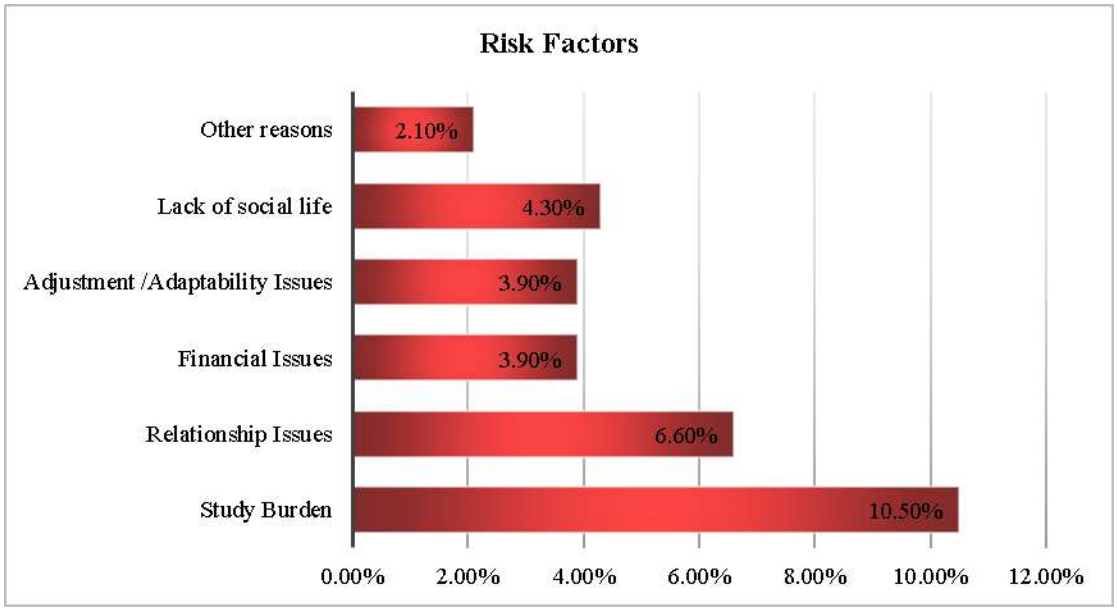


**Figure 2: Causes and Risk Factors for Suicidal Ideation**

Out of the total 522 participants, 10.50%) reported attempting suicide due to study burden with most having tried only once. The number of times students admitted to attempting suicide is shown in Fig.3.

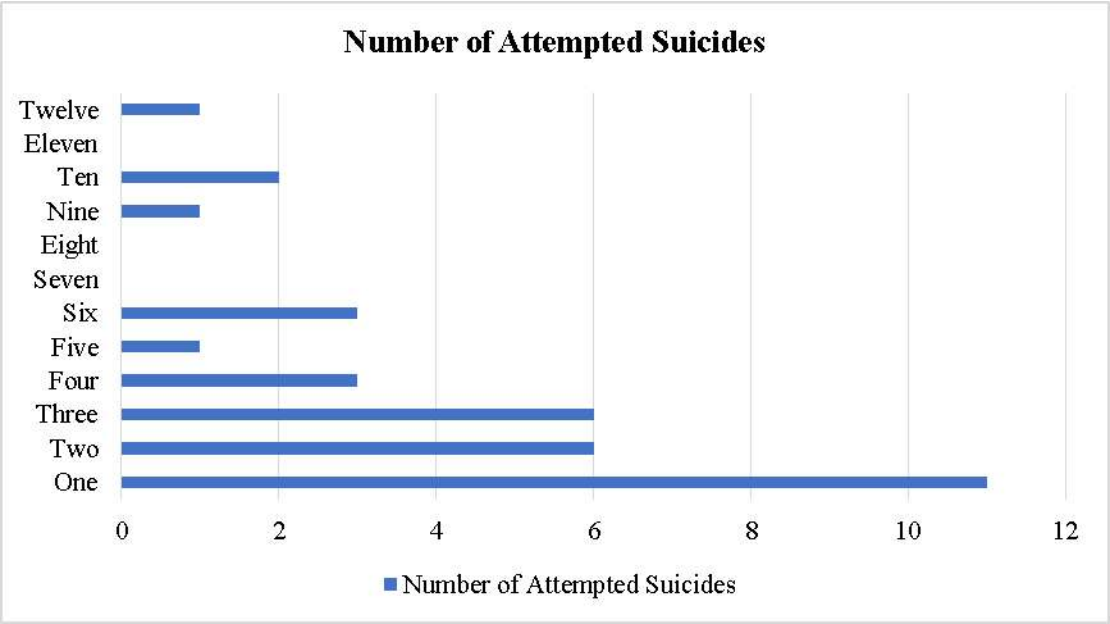


**Figure 3: Number of Attempted Suicides**

It was found that 350 (85%) students agreed that the prohibition of suicide in their religion had prevented them from attempting suicide. In contrast, 42 (9.2%) acknowledged a definitive chance of suicide if it was not prohibited in their religion, while 282 (61.6%) reported otherwise, with 134 (29.3%) being unsure. Overall, 357 (72.3%) students acknowledged having emotional support from various sources, as described in Table 3, while 127 (25.7%) reported not having any such support.

**Table 3: Sources of Emotional Support**

| Source of support in times of need | n % |
|---|---|
| Friends | 195 (43.3) |
| Family | 261 (59.3) |
| Self | 7 (1.6) |
| Prayers | 9 (2.0) |
| Others | 17 (3.9) |
| No support | 127 (25.7) |

Table 3 shows the sources of emotional support for medical students in times of need. The majority of students rely on family and friends for support, with a smaller proportion finding solace in self, prayers, or other means. The attitudes towards seeking professional help for suicidal thoughts and the benefits of therapy or medications are shown in Figure 4.

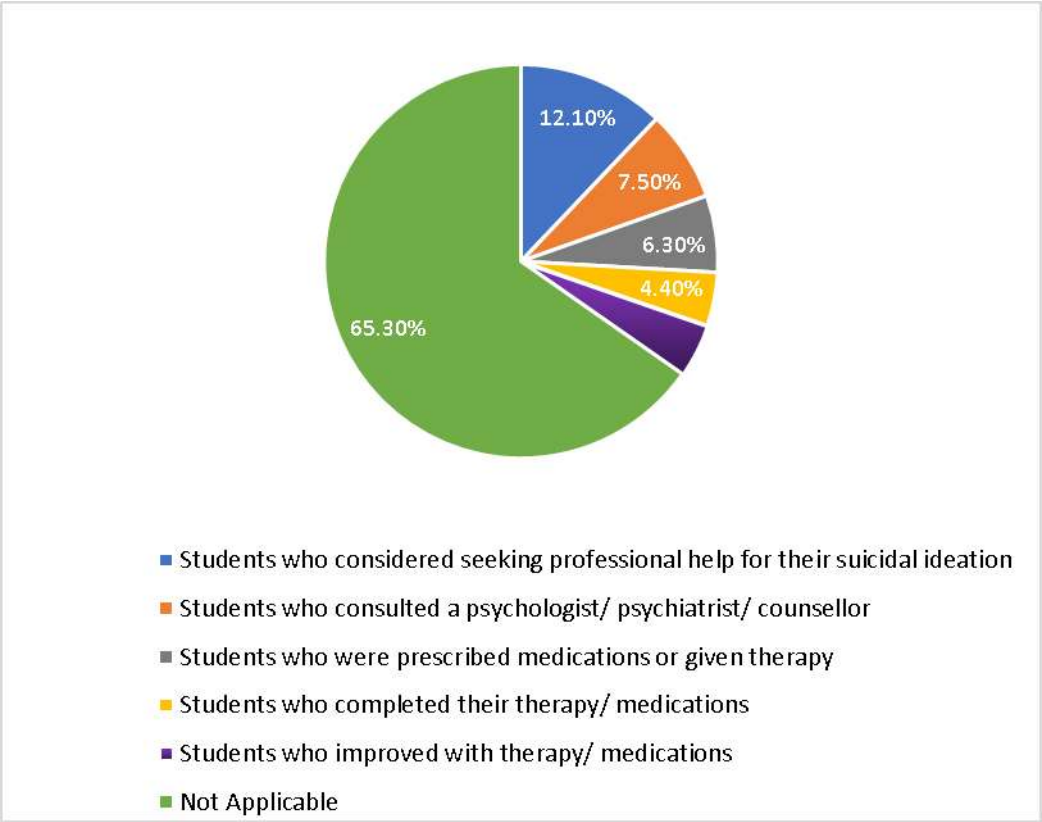


**Figure 4: Attitudes Toward Seeking Professional Help**

Figure 5 illustrates the various attitudes and actions taken by students towards seeking professional help for their suicidal ideation. The majority (65.30%) of the students did not consider seeking professional help, while smaller percentages took steps such as consulting a psychologist or psychiatrist and completing prescribed therapies.

## DISCUSSION

In light of the high prevalence of psychological distress and suicidal ideation among undergraduate medical students, it is crucial to investigate the underlying factors contributing to these issues. The present study aimed to evaluate the prevalence and factors associated with suicidal ideation among undergraduate medical students in Karachi. Our findings indicate a significant prevalence of psychological distress, with 75.5% of students reporting feelings of sadness, depression, or anxiety at various times in their lives. These findings are parallel with the study of Medical students in which self-reported mental distress experience was reported among 116/224 (51.8%) undergraduate students at the University of Dodoma in Tanzania [17]. These high levels of distress underscore the urgent need for mental health support and interventions within medical educational settings. Such importance of incorporating psychological support programs and mental health education in curricula is highlighted in a previous study [18].

A notable 31.0% of participants reported having suicidal ideation at some point in their lives. This finding is aligned with previous research suggesting high rates of suicidal thoughts among medical students globally due to the unique pressures they face in the form of intense academic workloads, leading to high levels of stress and burnout [19]. The transition into medical school appears to exacerbate these thoughts for many students, with 17.6% experiencing suicidal ideation for the first time after starting their studies and 16.3% reporting an increase in such ideation since beginning their medical education. These findings are also supported

by a study conducted in Bangladesh reports that 48% of medical students significantly experienced moderate to severe mental distress, with 34% experiencing anxiety and 28% reporting depressive symptoms [20]. Another study supported this notion by reporting the prevalence of depression at 48%, anxiety at 54%, stress at 50%, and suicidal ideation at 21% among undergraduate medical students in India [21]. In such a way, the frequency of suicidal thoughts in present study varied with 13.8% experiencing them annually, 7.4% monthly, 3.7% weekly, and 1.0% daily. This variation highlights the differing levels of severity and chronicity of suicidal ideation among the student population. The most common causes and risk factors for increased suicidal ideation included academic pressure, personal issues, and lack of support, which are consistent with findings from similar studies.

Such problems become aggravated when unconsidered as despite gaining knowledge about psychiatric distress and how to treat it, depression as an illness is often not regarded by medical students that requires treatment [22]. Thus, in response to these psychological challenges, various coping strategies are observed to be adopted by students, such as seeking support from friends (43.3%) and family (59.3%), or relying on self-measures and prayers. However, a significant proportion (25.7%) reported not having any emotional support, which could contribute to the persistence and exacerbation of suicidal thoughts. Emotional support systems are crucial in mitigating the impact of stress and preventing the progression from ideation to attempts.

Despite the high prevalence of suicidal ideation, only a small percentage of students sought professional help. The majority (65.3%) did not consider it, indicating potential barriers such as stigma, lack of awareness, or availability of mental health services. Those who did seek help reported various outcomes, with some finding therapy and medications beneficial. Enhancing the accessibility and acceptability of mental health services in medical schools could improve help-seeking behaviors and outcomes. Moreover, the role of religion in preventing suicide was significant, with 85% of students agreeing that religious prohibition deterred them from attempting suicide. This finding underscores the influence of cultural and religious beliefs on mental health behaviors and highlights the potential for religious counseling as part of a comprehensive mental health strategy.

## CONCLUSION

The study highlights the urgent need for comprehensive mental health support for medical students. Institutions should focus on reducing academic pressure, providing emotional support, and promoting professional mental health services to address the high prevalence of suicidal ideation. Integrating mental health education and support systems into medical curricula could help mitigate the risks and improve overall student well-being. Further research is needed to explore the most effective interventions and support mechanisms tailored to the specific needs of medical students in different cultural contexts.

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**Author's Contributions:**
SMAH: Concept & design, manuscript writing, statistical analysis, editing of manuscript, final approval of manuscript and responsible for integrity of research.
HS: Edited and review
SKKJ: Data collection, manuscript writing and responsible for integrity of research
MA, AN, SKF: Data collection and editing of manuscript
SMN: Data collection and statistical analysis
NH: Editing the manuscript

## REFERENCES

1. Rosal MC, Ockene IS, Ockene JK, Barrett SV, Ma Y, Hebert JR. A longitudinal study of students' depression at one medical school. Academic

med 1997;72(6):542-546. DOI: https://doi.org/10.1097/00001888-199706000-00022
2. Nair M, Moss N, Bashir A, Garate D, Thomas D, Fu S, et al. Mental health trends among medical students. Baylor University Medical Center Proceedings; 2023: Taylor & Francis. DOI: https://doi.org/10.1080/08998280.2023.2187207
3. Ghaffari E. A systematic review of suicide among Iranians physicians, etiology and solutions. Inter J Sci and Res Arch. 2024;12(2):1582-93. DOI: https://doi.org/10.30574/ijsra.2024.12.2.1243
4. Jayasudha J, Padmasri Y, Mounika R. IJCM_334A: The struggle within: suicidal ideation and its risk factors among the undergraduate medical students. Indian J Communit Med. 2024;49(1):96. DOI: https://doi.org/10.4103/ijcm.ijcm_abstract334.
5. Gomez S, White B, Browning J, DeLisser HM. Medical students' experience in a trauma chaplain shadowing program: a mixed method analysis. Medic educat online. 2020;25(1):1710896. DOI: https://doi.org/10.1080/10872981.2019.1710896.
6. Nelson G, Hanna R, Houri A, Klimes-Dougan B. Protective functions of religious traditions for suicide risk. Suicidol Online. 2012;3(1):59-71. Weblink: http://www.suicidology-online.com/pdf/SOL-2012-3-59-71.pdf
7. Abraham ZK, Sher L. Adolescent suicide as a global public health issue. Inter J adolescent med healt. 2019;31(4):20170036. DOI: https://doi.org/10.1515/ijamh-2017-0036
8. McAuliffe CM. Suicidal ideation as an articulation of intent: a focus for suicide prevention? Archives of Suicide Res. 2002;6(4):325-38. DOI: https://doi.org/10.1080/13811110214524
9. Rosiek A, Rosiek-Kryszewska A, Leksowski £, Leksowski K. Chronic stress and suicidal thinking among medical students. Inter J environment res public healt. 2016;13(2):212-217. DOI: https://doi.org/10.3390/ijerph13020212
10. Osama M, Islam MY, Hussain SA, Masroor SMZ, Burney MU, Masood MA, et al. Suicidal ideation among medical students of Pakistan: a cross-sectional study. J forensic and legal med. 2014;27:65-8. DOI: https://doi.org/10.1016/j.jflm.2014.08.006
11. Koziarska-Roœciszewska M, Tchórzewska K, Tchórzewski J, Roœciszewski P, Widawska M, Kopacz K, et al. Mental well-being among students of selected medical universities in Poland. The role of a family physician. Family Med Prim Care Rev. 2022;24(3):1-6. DOI: https://doi.org/10.5114/fmpcr.2022.118282
12. Slabadiene M, Lygnugaryte-Griksiene A. Suicidal thoughts, intentions and suicide attempts by Lithuanian medical students of the Lithuanian University of Health Sciences. Biological Psychiatry & Psychopharmacology/Biologinë Psichiatrija ir Psichofarmakologija. 2020;22(1). Weblink: https://biological-psychiatry.eu/wp-content/uploads/2020/06/BPP.
13. Miletic V, Lukovic JA, Ratkovic N, Aleksic D, Grgurevic A. Demographic risk factors for suicide and depression among Serbian medical school students. Social psychiatry and psychiatric epidemiol. 2015;50:633-638. DOI: https://doi.org/10.1007/s00127-014-0950-9
14. Menezes RG, Subba SH, Sathian B, Kharoshah MA, Senthilkumaran S, Pant S, et al. Suicidal ideation among students of a medical college in Western Nepal: a cross-sectional study. Legal Med. 2012;14(4):183-187. DOI: https://doi.org/10.1016/j.legalmed.2012.02.004
15. Eskin M, Voracek M, Stieger S, Altinyazar V. A cross-cultural investigation of suicidal behavior and attitudes in Austrian and Turkish medical students. Social psychiatry and psychiatric epidemiol. 2011;46:813-23. DOI: https://doi.org/10.1007/s00127-010-0254-7
16. Amiri L, Voracek M, Yousef S, Galadari A, Yammahi S, Sadeghi M-R, et al. Suicidal behavior and attitudes among medical students in the United Arab Emirates. Crisis. 2013;2(1):1-6. DOI: https://doi.org/10.1027/0227-5910/a000513
17. Rweyemamu LP, Mbotwa CH, Massawe JI, Mramba RP. Mental distress and associated factors among undergraduate students: evidence from a cross-sectional study at the University

of Dodoma, Tanzania. Discover Mental Healt. 2024;4(1):44-49. DOI: https://doi.org/10.1007/s44192-024-00098-x
18. Makie³a M, Marcinowicz P, Wiêd³ocha M, Szulc A. Zdrowie psychiczne ma znaczenie: rozszyfrowanie stanu psychicznego studentów medycyny. J Psychiatry and Clinic Psychol. 2024;24(2):159-67. DOI: https://doi.org/10.15557/pipk.2024.0020
19. Mateen A, Kumar V, Singh AK, Yadav B, Mahto M, Mahato S, et al. Suicide and Suicidal Ideation in Medical Students: A Systematic Rev. Cureus. 2024;16(7)1-6. DOI: https://doi.org/10.7759/cureus.65246
20. Begum A. The Prevalence of Mental Distress and the Role of Social Support among Medical Students in Bangladesh: A Cross-Sectional Study. Sch J App Med Sci. 2024;11(1):1458-66. DOI: https://doi.org/10.36347/sjams.2024.v12i11.005
21. Dutta G, Rajendran N, Kumar T, Varthya SB, Rajendran V. Prevalence of depression among undergraduate medical students in India: A systemic review and meta-analysis. Cureus. 2023;15(1):1-6. DOI: https://doi.org/10.7759/cureus.33590
22. Suwalska J, Suwalska A, Szczygie³ M, £ojko D. Medical students and stigma of depression. Part 2. Self-stigma. Psychiatria polska. 2017;51(3):503-513. DOI: https://doi.org/10.12740/pp/onlinefirst/67373

**ORIGINAL ARTICLE**

# GROWTH STUNTING PREVENTION IN CHILDREN: KNOWLEDGE AND PERCEPTION OF ORAL HEALTH PRACTITIONERS AT BAQAI DENTAL COLLEGE; KARACHI

Nauman Sheikh[1], Sana Farrukh[2], Qasim Saleem[3*], Sharjeel Basheer[4], Tanzeela Shaikh[5], Aimen Zahid[6], Samara khan[7]

## ABSTRACT

**Objectives:** The study aimed to assess the knowledge and perceptions of oral health practitioners at Baqai Dental College regarding growth stunting and its prevention.

**Methods:** This cross-sectional descriptive study was conducted at Baqai Medical University, involving 70 dentists with over two years of professional experience. Dentists who did not provide valid informed consent were excluded. Data were collected using a questionnaire assessing two dimensions: (1) knowledge of nutrition, growth, development, and health behavior categorized as good (76–100%), sufficient (56–75%), or poor (<56%); and (2) perceptions of growth stunting and its prevention—classified as positive or negative based on the mean score. Data were analyzed using SPSS version 20.

**Results:** The analysis revealed that 83.3% of participants demonstrated good knowledge of growth stunting and its prevention, 13.9% had moderate knowledge, and 2.8% exhibited poor knowledge. Regarding perception, 40.28% of participants had positive perceptions, while 59.72% had negative perceptions of their role in stunting prevention.

**Conclusion:** These findings highlight a strong foundational knowledge base among dentists but indicate the need for improvement in enhancing their perceptions and confidence in addressing stunting prevention in Pakistan.

**Keywords:** Knowledge, perception, dentists, growth stunting

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## INTRODUCTION

Growth stunting, characterized by impaired physical and cognitive development, is a significant public health issue affecting children under five years of age globally [1]. According to the World Health Organization (WHO), growth stunting also known as nutritional stunting is a condition in which a child's height-for-age is significantly below the expected standard for their age and sex. Growth stunting is a major public health concern in Pakistan and is closely linked to nutritional deficiencies and oral health. Dentists, as key health professionals, have an essential role in addressing this issue. In Pakistan, approximately 38% of children are stunted, primarily due to prolonged nutritional deficiencies during critical developmental periods [2]. This

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condition results in long-term consequences on health, productivity, and economic potential, with Sindh province in particular facing alarming stunting rates, where nearly 50% of children are affected. Similarly, in Indonesia, growth stunting remains a major concern, with 30.8% of children less than five years of age affected, surpassing the WHO threshold of 20%. This high prevalence places Indonesia among the top countries with a significant burden of stunting, highlighting the urgent need for targeted interventions [3]. The condition is closely linked to malnutrition, which not only affects physical growth but also impairs cognitive development, ultimately impacting children's productivity and intellectual abilities.

One of the major health concerns associated with growth stunting is its effect on oral health. Malnutrition can lead to dental problems, particularly dental caries, which are common among stunted children. Dental caries, a disease that begins with demineralization of the dental tissue, can interfere with a child's nutritional intake, leading to digestive issues and difficulty eating. Additionally, stunting can reduce the salivary function that is crucial for oral health, making children more susceptible to cavities and other oral diseases. Moreover, oral health problems can exacerbate growth deficiencies by further limiting nutrient intake and impairing digestion, creating a vicious cycle of poor growth and health [4,5].

There is also a significant correlation between the oral health of mothers and children, influenced by factors such as maternal education and socioeconomic status. In Indonesia, the relationship between growth stunting and oral health issues further emphasizes the role of dentists in addressing this public health challenge [6]. Despite the clear connection, dentists' involvement in stunting prevention remains insufficient, particularly in countries like Pakistan and Indonesia. Dentists, as key healthcare providers, are in a unique position to contribute to stunting prevention by promoting oral health and providing dietary guidance [7,8].

Despite the recognized impact of oral health on stunting, the role of dentists in stunting prevention remains underutilized in many regions. There is a lack of research on the knowledge and perceptions of dentists regarding stunting prevention, which hinders the development of effective interventions [9,10]. Assessing the knowledge and perceptions of dentists is crucial to enhancing their contribution to this public health issue. As frontline healthcare providers, dentists have the potential to play a pivotal role in preventing growth stunting by addressing oral health issues and promoting proper nutrition [11]. Understanding dentists' current knowledge and perceptions will help design more effective strategies for stunting prevention, particularly in areas with high stunting rates. By incorporating oral health education and dietary counseling into their practice, dentists can contribute significantly to improving children's overall health and growth outcomes.

This study aims to evaluate the knowledge and perceptions of growth stunting prevention among oral health practitioners at Baqai Dental College, Karachi. By assessing the current awareness and attitudes of dentists, this research will contribute to designing targeted interventions that can enhance stunting prevention efforts, ultimately improving the quality of life for children affected by stunting.

## METHODOLOGY

This descriptive study was approved by the Ethical Review Board of Baqai Dental College and aimed to assess the knowledge and perceptions of growth stunting prevention among oral health practitioners. A cross-sectional design was employed, conducted over a three-month period at Baqai Medical University. The primary data collection tool was a structured questionnaire.

A total of 70 dentists were included in the study, selected through convenience sampling. Participants were required to have more than two years of professional experience in dentistry, and those who did not provide valid informed consent were excluded. The questionnaire used for data collection consisted of two sections. The first section assessed

knowledge through multiple-choice questions, covering topics such as the definition of growth stunting, its causes, and preventive measures, with a focus on its relationship to oral health. The second section evaluated perceptions using statements on a 5-point Likert scale, examining the dentists' attitudes toward their role in stunting prevention. The perception questions were categorized into four dimensions: awareness, adoption, implementation, and maintenance of stunting prevention practices. The questionnaire consisted of two parts. The first part focused on knowledge related to nutrition, growth, and development, while the second part evaluated the participants' perceptions regarding stunting prevention. This method allowed for a comprehensive evaluation of both knowledge and perceptions of growth stunting and its prevention.

Data were analyzed using statistical packages for social sciences (SPSS) version 20. Descriptive statistics were used to summarize the demographic characteristics of the participants. Knowledge levels were categorized into three groups: "good knowledge" (76-100%), "sufficient knowledge" (56-75%), and "poor knowledge" (<56%). Perceptions were classified as either positive or negative based on whether the total score exceeded or fell below the mean score, respectively. Quantitative data were expressed as mean ± SD, while qualitative data were reported as frequencies and percentages.

## RESULTS

The study aimed to evaluate the knowledge and perceptions of dentists in Pakistan regarding their role in stunting prevention. A total of 72 participants were surveyed, with data collected on demographics, knowledge indicators, and perceptions (table 1).

The study gathered data from 72 participants, with the average age being 34.76 years (ranging from 22 to 69). Participants were almost evenly split by gender: 48.6% male (n = 35) and 51.4% female (n = 37). Regarding qualifications, 56.9% (n = 41) were general dentists (GD) (Completed a Doctor of Dental Surgery (DDS) or Doctor of Dental Medicine (DMD) degree) while 43.1% (n = 31) were specialist dentists (SD) (Along with DDS or DDM, pursue additional formal education and training in a specialty area such as Orthodontics (braces and alignment), Periodontics (gums and supporting structures), Endodontics (root canals), Oral and Maxillofacial Surgery etc. Most participants had been practicing dentistry for 5 to 10 years (47.2%), while a smaller fraction had less than 5 years (23.6%) or more than 10 years (29.2%) of experience.

**Table 1: Participant Baseline Characteristics**

| Characteristic | N % |
|---|---|
| **Gender** | |
| **Male** | 35(48.6) |
| **Female** | 37(51.4) |
| **Qualification** | |
| **General Dentist (GD)** | 41(56.9) |
| **Specialist Dentist (SD)** | 31(43.1) |
| **Years of Practice** | |
| **Less than 5 years** | 17(23.6) |
| **5 to 10 years** | 34(47.2) |
| **More than 10 years** | 21(29.2) |

The knowledge levels were assessed using eight indicators, with responses classified as "Correct," "Wrong," or "Not certain." The table 2 below outlines the response distribution for each indicator. The study assessed dentists' knowledge regarding stunting, examining several indicators of understanding labeled K1 through K8. The findings showed a range of correct answers, with the highest accuracy in understanding basic definitions and the relationship with nutrition, and lower accuracy in more specific topics like the influence of maternal oral health on stunting. For K1, concerning the general awareness and definition of stunting, 83.3% responded correctly. K2, which measured knowledge of the correlation between stunting and nutrition, had 79.2% correct responses. The impact of oral health on stunting (K3) saw 66.7% correctness, while awareness of the connection between maternal oral health and stunting (K4) was lower, with 59.7% correct. Indicators covering specific preventive and risk factors (K5–K8) showed correct responses ranging from 56.9% to 66.6%. These results suggest that dentists are most knowledgeable about foundational aspects of stunting but demonstrate gaps in understanding specific risk factors and maternal health impacts. The overall trend indicates that basic definitions and general nutrition are well understood, while more nuanced aspects, such as the influence of maternal oral health, present opportunities for targeted education.

**Table 2: Assessment of Dentists' Knowledge Regarding Stunting**

| Indicator | Correct (%) | Wrong (%) | Not Certan (%) |
|---|---|---|---|
| **Definition of stunting** | 60 (83.3%) | 2 (2.8%) | 10 (13.9%) |
| **Correlation with nutrition** | 57 (79.2%) | 5 (6.9%) | 10 (13.9%) |
| **Impact of oral health on stunting** | 48 (66.7%) | 4 (5.6%) | 20 (27.8%) |
| **Maternal oral health's effect** | 43 (59.7%) | 5 (6.9%) | 24 (33.3%) |
| **Preventive measures** | 44 (66.7%) | 8 (11.1%) | 20 (27.8%) |
| **Risk factors** | 42 (58.3%) | 5 (6.9%) | 25 (34.7%) |
| **Connection with child development** | 41 (56.9%) | 8 (11.1%) | 23 (31.9%) |
| **Preventive strategies** | 48 (66.6%) | 3 (4.2%) | 21 (29.2%) |

Perceptions of dentists regarding their role in stunting prevention were also examined. Responses were categorized by levels of agreement with key statements related to stunting prevention can be seen in table 3. It outlines the levels of agreement for perceptions about the role of dentists in stunting prevention, indicating that while there is general agreement on the importance of involvement, significant portions of participants remain uncertain about specific aspects, such as dietary education and ANC.

Regarding the statement about the importance of dentists' involvement in reducing stunting, 25% of participants "totally agreed," while 31.9% agreed, and 22.2% were unsure. This highlights some ambiguity about the dentist's role in stunting prevention. For the perception that providing dietary education is essential for preventing stunting, 20.8% of participants "totally agreed," while 30.6% agreed; however, 22.2% were unsure, suggesting that some dentists may not fully recognize the connection between nutrition and stunting prevention. Active participation in antenatal care (ANC) received less agreement, with only 19.4% "totally agreeing" and 25% uncertain about their role in this area. Additionally, 31.9% "totally agreed" that stunting in children is related to maternal oral health behaviors, but 13.9% were unsure. These findings point to varying degrees of confidence and clarity regarding dentists' roles in stunting prevention, particularly in areas like antenatal care.

**Table 3: Perception of Dentists on Stunting Prevention**

| Statement | Totally Agree (%) | Agree (%) | Enough Agree (%) | Not Sure (%) | Absolutely Not Agree (%) |
|---|---|---|---|---|---|
| **Dentists' role in reducing stunting** | 18 (25.0%) | 23(31.9%) | 9(12.5%) | 16(22.2%) | 6 (8.3%) |
| **Need for active role in stunting prevention** | 16(22.2%) | 20(27.8%) | 17(23.6%) | 12(16.7%) | 7 (9.7%) |
| **Contribution to antenatal care (ANC)** | 14(19.4%) | 21(29.2%) | 12(16.7%) | 18(25.0%) | 7 (9.7%) |
| **Diet education for oral health & stunting** | 15(20.8%) | 22(30.6%) | 11(15.3%) | 16(22.2%) | 8 (11.1%) |
| **Healthy teeth and mouth behavior prevent stunting** | 29(40.3%) | 14(19.4%) | 16(22.2%) | 9(12.5%) | 4 (5.6%) |
| **Stunting relates to child's oral health through maternal behavior** | 23 (31.9%) | 18 (25.0%) | 17 (23.6%) | 10 (13.9%) | 4 (5.6%) |
| **Prevention of early childhood caries and stunting support each other** | 27 (37.5%) | 13 (18.1%) | 14 (19.4%) | 14 (19.4%) | 4 (5.6%) |

Finally, dentists' views on preventive actions to combat stunting were assessed, revealing supportive attitudes toward providing nutritional advice and promoting healthy eating habits. However, some responses indicated uncertainty about the relevance of these interventions as shown in table 4. For instance, 41.7% "totally agreed" that providing nutritional advice is crucial for stunting prevention and 19.4% agreed, yet 12.5% were unsure. Promoting healthy food was similarly viewed positively, with 40.3% "totally agreeing" and 22.2% agreeing, though 11.1% expressed uncertainty. Support for promoting clean and healthy lifestyles as a preventive measure received similar levels of agreement, with 36.1% "totally agreeing" and 29.2% agreeing. It suggest that while dentists are generally supportive of preventive actions against stunting, there remains variability in confidence and understanding about specific strategies, underscoring the potential benefit of further education and training focused on the dentist's role in preventive care related to stunting.

**Table 4: Preventive Actions to Combat Stunting**

| Statement | Totally Agree (%) | Agree (%) | Enough Agree (%) | Not Sure (%) | Absolutely Not Agree (%) |
|---|---|---|---|---|---|
| **Providing nutritional advice for stunting prevention** | 30 (41.7%) | 14 (19.4%) | 13 (18.1%) | 9 (12.5%) | 6 (8.3%) |
| **Active promotion of healthy food importance for stunting prevention** | 29 (40.3%) | 16 (22.2%) | 15 (20.8%) | 8 (11.1%) | 4 (5.6%) |
| **Stunting prevention by adopting a clean and healthy lifestyle** | 26 (36.1%) | 21 (29.2%) | 9 (12.5%) | 12 (16.7%) | 4 (5.6%) |

## DISCUSSION

Growth stunting, characterized by impaired growth and development, remains a pressing public health challenge globally. The findings of this study provide insight into the knowledge and perceptions of oral health practitioners regarding growth stunting and its prevention, particularly in the context of its implications for oral health and overall child development. The discussion centers on the implications of the results, comparisons with existing literature, and recommendations for integrating oral health into stunting prevention strategies.

The study revealed that a majority of dentists exhibited good knowledge of growth stunting and its prevention, with 76–100% scoring within the "good knowledge" category [13]. This aligns with global trends indicating that healthcare professionals are increasingly aware of stunting as a multifaceted issue affecting child health. However, knowledge gaps were observed in specific areas, such as the correlation between maternal oral health and growth stunting, where correct responses were notably lower [14]. These findings resonate with previous studies, such as Nugraha et al., which highlighted limited awareness among health workers about the impact of maternal oral health on fetal and child development. The observed gaps underscore the need for targeted educational interventions. Stunting is influenced by maternal health during pregnancy, including oral health status. Poor oral health, particularly periodontitis, has been associated with adverse pregnancy outcomes, such as preeclampsia and low birth weight, both of which are precursors to stunting. Addressing these knowledge gaps could empower dentists to play a proactive role in prenatal care and maternal health counseling [15,16].

Perception analysis indicated a positive inclination among dentists toward their role in stunting prevention, with most participants recognizing the importance of oral health in addressing nutritional deficiencies. However, uncertainty was evident in areas such as dietary counseling and contributions to antenatal care. This aligns with findings from studies in Egypt, where health workers demonstrated good knowledge but less confidence in their roles in integrated health strategies. The relatively lower confidence in participating in antenatal care may reflect a lack of interdisciplinary collaboration and insufficient training in non-dental health aspects [17].

The study reinforces the critical interplay between oral health and stunting. Dental caries, enamel hypoplasia, and salivary dysfunction commonly seen in malnourished children compromise nutritional intake, exacerbating stunting. Similarly, stunting-related nutritional deficiencies impair oral health, creating a cyclical relationship. These findings emphasize the need for dentists to incorporate nutritional assessments into routine oral health evaluations, particularly for children in high-risk populations [18].

Dentists, as key frontline healthcare professionals, play an essential role in public health, particularly in the prevention of childhood stunting. Their position allows them to contribute significantly to early detection and intervention efforts. One critical area is dietary counseling, where dentists can provide mothers and children with vital guidance on nutrition and oral hygiene addressing both immediate dietary issues and long-term nutritional deficiencies. Additionally, integrating dental care with primary healthcare services enhances the overall impact of stunting prevention. Collaboration between dentists, pediatricians, nutritionists, and other health professionals helps develop and implement comprehensive strategies tailored to the needs of vulnerable populations. Community outreach is another avenue where dentists can make a substantial impact. Public health campaigns that highlight the connection between oral health and stunting can raise awareness and promote preventive behaviors within communities at risk. The Government of Indonesia's policy under Permenkes RI no. 39 of 2016 is a commendable example, where dentists are actively involved in stunting prevention through early screening and intervention during the crucial first 1,000 days of a child's life. This integrated approach offers a valuable model that can be adapted

and implemented in Pakistan and other countries facing similar public health challenges [19]. To ensure the impact of this study reaches beyond academic circles, it is essential to disseminate the findings to both the oral health community and public health policymakers. This can be achieved through workshops, seminars, and continued professional education programs for dental practitioners. Additionally, presenting the results to health authorities and policymakers can help advocate for the inclusion of oral health in national nutrition and child health policies. Collaborations with professional dental associations, health ministries, and public health organizations will be critical to translating these insights into practical, community-level interventions that support child growth and development [20].

The findings of this study suggest a need for continuous professional development programs to address identified knowledge gaps. Workshops and training sessions focused on maternal and child oral health, as well as interdisciplinary collaboration, could enhance the capacity of dentists to contribute to stunting prevention. Further research is needed to explore the impact of these interventions on stunting rates and child health outcomes. Additionally, expanding the scope of research to include diverse geographical regions and healthcare settings could provide a more comprehensive understanding of dentists' roles in stunting prevention.

**Limitations**

While this study provides valuable insights, its findings are limited by the relatively small sample size and geographical scope. Future studies should aim to include a larger and more diverse population to enhance generalizability. Moreover, qualitative research exploring the perspectives of dentists could provide deeper insights into the barriers and facilitators to their involvement in stunting prevention.

## CONCLUSION

Dentists show strong knowledge of basic stunting concepts and nutrition links, but have notable gaps in understanding specific risk factors and the impact of maternal oral health. By bridging knowledge gaps and enhancing interdisciplinary collaboration, dentists can significantly contribute to reducing stunting prevalence and improving child health outcomes. Continued efforts to integrate oral health into public health frameworks will be essential in combating this complex and multifaceted issue.

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**Authors' Contribution**

NS, SF: Concept, design, interpretation of data, final approval of manuscript and responsible for integrity of research

QS, SB, TS, & AZ: Collected and managed the data, wrote and edited the manuscript

TS: Tabulated the data, wrote the manuscript and finalizing the draft

## REFERENCES

1. Sadida ZJ, Indriyanti R, Setiawan AS. Does growth stunting correlate with oral health in children? A systematic review. Eur J Dent. 2022;16(1):32–40. DOI: 10.1055/s-0041-1731887.
2. Ponum M, Khan S, Hasan O, Mahmood MT, Abbas A, Iftikhar M, et al. Stunting diagnostic and awareness: Impact assessment study of sociodemographic factors of stunting among school-going children of Pakistan. BMC Pediatr. 2020;20(1):232-238. DOI: 10.1186/s12887-020-02139-0.
3. Mahmood T, Abbas F, Kumar R, Somrongthong R. Why under five children are stunted in Pakistan? A multilevel analysis of Punjab Multiple Indicator Cluster Survey (MICS-2014). BMC Public Health. 2020;20(1):952-959. DOI: 10.1186/s12889-020-09110-9.

4. Sadida ZJ, Indriyanti R, Setiawan AS. Stunting as a predictor of early childhood oral health: A meta-analysis. J Glob Health Sci. 2022;4(1):1–8. DOI: 10.1055/s-0041-1731887.
5. Monse B, Benzian H, Heinrich-Weltzien R, Holmgren C, van Palenstein Helderman W. Linking oral health with stunting prevention: An analysis of nutritional factors in underdeveloped regions. Glob Pediatr Health. 2020;7(1): 2333794X20923413. DOI:10.1177/ 2333794X20923413.
6. Sadida ZJ, Indriyanti R, Setiawan AS. The bi-directional relationship between growth stunting and early childhood caries in developing countries. Front Public Healt. 2023;11(1):1234893. DOI:10.3389/ fpubh. 2023.1234893.
7. Abdat M, Chairunas C. Analysis of status of oral stunting in toddlers and its relationship with mother's parenting. J Dentomaxillofac Sci. 2023;6(2):114–119. Available from: https://www.researchgate.net/publication/359027207
8. Abdulaziz R, Suryanti N, Setiawan AS. A review on maternal parenting, child's growth stunting, and oral health. Eur J Dent. 2024;18(1):26–40. DOI: 10.1055/s-0043-1764428.
9. Sadida ZJ, Indriyanti R, Setiawan AS. Stunting and its effects on salivary biomarkers and oral health. Open Dent J. 2024;19(1): e18742106366969. Available from: https://opendentistryjournal.com.
10. Mayfitriana Z. Dentist perspectives on growth stunting prevention in Bandung, Indonesia. Eur J Dent. 2023;17(3):640–646. DOI: 10.1055/s-0042-1748999.
11. Mayfitriana Z, Suwargiani AA, Setiawan AS. Growth stunting prevention in Indonesia: dentist knowledge and perception. Europ J Dentist. 2023;17(03):642-8. DOI: 10.1055/s-0042-1757465.
12. El-Rafie Me, Nesreen M, Shamaila M. Knowledge, attitude and practice of health care providers at primary health care setting regarding stunting among Egyptian under five years. Med J Cairo Uni. 2018;86(03):265-73. DOI: 10.21608/ mjcu.2018.55097.
13. Nugraha P. The relationship between maternal oral health and child stunting in Indonesia: A public health perspective. Indones J Public Health. 2022;15(2):85–93. DOI:10.20473/ ijph.v15i2.2022.85-93.
14. Sutarto P. Oral health as a determinant of nutritional status in stunted children: A review. J Pediatr Dent. 2023;45(1):34–41. DOI: 10.1055/ s-0043-1764429.
15. Liem S, Panggabean H, Farady R. Social perception on stunting in Tangerang District. J Ekologi Kesehatan. 2021;20(1):37–47. DOI: 10.7454/jek.v20i1.2021.37-47.
16. Tariq J, Sajjad A, Zakar R, Zakar MZ, Fischer F. Factors associated with undernutrition in children under two years: Secondary data analysis based on the Pakistan Demographic and Health Survey 2012–2013. Nutrients. 2020;12(6):676-679. DOI: 10.3390/nu12060676.
17. Dimaisip-Nabuab J, Duijster D, Benzian H, Heinrich-Weltzien R, Homsavath A, Monse B, et al. Nutritional status, dental caries, and tooth eruption in children: A longitudinal study in Cambodia, Indonesia, and Lao PDR. BMC Pediatr. 2020;20(1):1–11. DOI:10.1186/s12887-020-02140-7.
18. Sheetal A, Hiremath VK, Patil AG, Sajjansetty S, Kumar SR. Malnutrition and its oral outcome - a review. J Clin Diagn Res. 2020; 14(1):178–180. DOI: 10.7860/JCDR/2020/ 5104.2702.
19. Kamal Elden NM, El-Rafie M, Zamir Ul Hassan, Shamaila M. Knowledge, attitude, and practice of health care providers at primary health care settings regarding stunting among Egyptian children under five years. Med J Cairo Univ. 2020;88(1):265–273. DOI: 10.21608/mjcu. 2020.123456.
20. Nugraha AP, Rezkita F, Sarasati A. The crucial dentist role toward stunting prevention in Indonesia. Indian J Public Health Res Dev. 2020;11(3):123–127. DOI: 10.37506/v11/i3/ 2020/ijphrd/195123.

**MINI REVIEW**

# SAMPLE SIZE CALCULATION FOR EPIDEMIOLOGICAL STUDIES

Maria Rahim[1*], Mir Ghulam Hayder Talpur[2]

## ABSTRACT

Any research project's design needs to incorporate a definition of the sample size required to conduct the investigation. The number of patients needed to achieve the desired study goal is estimated by this sample size. For this purpose, we do sampling to achieve the desire result of research in term of time and money. This article explains how to determine the sample size in the types of studies that are most frequently observed in health research and how to estimate it using the many statistical programs that are included in the commonly utilized sample size calculation software. To ensure reliable and valid result determining an appropriate sample size is crucial. The formula for calculating sample size varies depending on whether you are estimating a mean or a proportion (percentage). It also depends on whether the population is finite or infinite. Similarly, commonly used statistical programs such as G*Power, R software, PASS, and OpenEpi are frequently mentioned.

**Keywords:** Sample Size, Epidemiological, Proportion Studies, Diagnostics Studies, Mean Difference, G-Power, R Software, Open-epi

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## INTRODUCTION

To conduct epidemiological study, determining the appropriate sample size is crucial step. To ensure that study is adequately powered to detect meaningful result and association between variables [1-3]. Along with an appropriate and comprehensive experimental design, the hypothesis of the study must be validated through a consistent relationship between the number of observations made, their potential repetitions, their representative, and the overall quality of the evidence. This quantity of observations or samples is known as the sample size (SS) and likewise denoted with the letter *n* [4]. A set of mathematical formulas that have been created to ensure accuracy in predicting population parameters or to produce meaningful results in studies that compare multiple treatment plans or groups are applied in the SS calculation.

Establishing the SS prior to the study's implementation is crucial since it ensures that a sufficient number of patients will be recruited. If this is not done, there is a risk of collecting insufficient data, leading to imprecise results and a failure to detect significant differences that may actually exist. On the other hand, collecting excessive data can result in unnecessary tests, wasting time and resources. Accurate calculation of sample size requires relevant background information, which can be obtained from previous research articles, books, or pilot studies. Pilot studies mean small-scale investigation conducted in the same settings as the global or larger study, but with a restricted 10% of actual sample size. Pilot studies help identify

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potential implementation issues during the study. They also provide preliminary data that can be used to determine the final sample size. Certain studies have trouble finding the required number of participants; these studies typically involve rare diseases, such idiopathic solar urticaria, for which there aren't many cases. Even in these situations, though, it is still wise to ascertain the SS, making an effort to conduct the study across different situation, with each situation contributing a specific number of instances. In cases when such research is not feasible, the number of subjects who can be recruited for the research study is taken into account when making decisions on SS; nevertheless, this entails a significant inconvenience in terms of decreased precision [5-7].

It is not uncommon for studies to define two main aims and several supplementary objectives. Theoretically, each primary objective should be associated with a distinct sample size (SS) calculation. Selecting a smaller sample size reduces statistical power. Ideally, the primary objectives requiring the largest sample sizes should be prioritized. Otherwise, those main objectives with insufficient sample sizes may ultimately be downgraded to secondary or exploratory aims [8-10].

The size of the origin population affects the SS to some extent. To determine the required sample size for the research study, we typically begin by assuming that subject participated in study involve populations of unknown or infinite size. We may need to sample populations of limited size, or N, in some investigations. This is especially important in descriptive surveys, where the population size must be considered when calculating the sample size. In practice, sample size formulas that include the population size (N) tend to converge with those that do not when N is large. Most researchers consider a population to be finite if it consists of fewer than 100,000 individuals.

Therefore, it is typical for the investigator to determine the number of observations based on the time available for conducting the study, the available financial and human resources, and other factors.

## ESSENTIAL CONSIDERATION FOR CALCULATING OF SAMPLE SIZE

When estimating sample size, researchers must first consider several key factors, as these determine which formula is appropriate. The main components include the following; [10,11]

1. The Study type involved: observational, descriptive, experimental, animal and in-vitro. In descriptive studies with finite populations, researchers need to know the population size, N.
2. We are prepared to accept errors of type I (á) and type II (â). With the following exclusions, we use á= 0.05 and á = 0.10 or 0.20 as standard values in case of uncertainty, For descriptive research, the precision (width or amplitude of the confidence interval) and the á error, or estimation confidence interval, are all that are needed. On the other hand, in experimental or observational studies, both á and â errors are required to calculate sample size.
3. The response indicates the variables that need to be monitored along with their degree of measurement (that is, whether they are means or proportions (%) or quantitative or qualitative).
4. The smallest variation to be detected between the treatment groups or between the null hypothesis and the alternative hypothesis. Depending on the study at hand, this will vary. The more participants we need to include in the study, the smaller the difference we hope to find. This difference ought to be both reasonable and clinically relevant. The amplitude of the confidence interval determined during the estimate process in descriptive research indicates the difference.
5. When analyzing quantitative variables, one must take into account their variability, which is expressed in terms of variance or standard deviation (SD). The number of participants needed is significantly less when there is less variability than when the variability related to the trait under analysis is high. Pilot studies or

sources in the literature can provide the variability.

6. The hypothesis test's skewness, or laterality, determines whether it has two or one tails. One-tailed tests frequently call for a smaller sample size than two-tailed tests, however the first kind should only be taken into consideration if the test's direction is clear
7. Losses reported for follow-up or patient localization. The sample calculation should account for these losses.
8. The variety of groups that require to be contrasted and the contrasts that should be drawn between them when comparing multiple groups, the formulas used to calculate SS need to specify how many groups were taken into account during the investigation. If this isn't done, there's a chance that ? mistake will spread and beyond the 5% original threshold [11,12]

*Sample Size Calculation*

For calculating sample size, different formula required according to objective to research, we can distinguish them accordingly as descriptive studies, experimental studies, in-vitro, animal studies.

*Descriptive Studies*

Studies that aim to determine demographic parameters typically mean and proportions or percentages are referred to as descriptive studies. There is a discernible difference between the studies that have finite populations and those that have infinite populations [12].

*Finite Population:*

Estimation of a proportion is, percentage or prevalence should calculate through the following formula.

$$n = \frac{t_\alpha^2 * p * q * N}{(N-1) * e^2 + t_\alpha^2 * p * q}$$

Where, n = sample size to be calculated; N = the population's size that the sample is taken from; p = estimated proportion of the population with the characteristic of interest q = 1 - p (this represent the proportion without the characteristics); e = accepted margin of error (usually between 5 and 10%). (This error is one-half of the width of the confidence interval calculated for the parameter, or equivalently 2*e is the width or amplitude of the interval. It is expressed as a percentage); $t^2$ = value of the normal curve associated to the confidence level. For a confidence of 90%, the value is 1.64 ,95%, this value is 1.96; and for a confidence of 99% it is found to be 2.57 (for two-tailed testing).

*Mean Estimation:*

The formula for calculating mean estimation is given below, in situation we find out the different in mean formula for calculating sample size (n) when sampling from a finite population. This specific formula is often referred to as Yamane's Formula for Sample Size for Finite Populations where s population variance.

$$n = \frac{t_\alpha^2 * s^2 * N}{(N-1) * e^2 + t_\alpha^2 * s^2}$$

The above mentioned situation can be calculated in all available software of sample size calculation, G-Power, open epi, PASS and Rpackages by inserting the result from previous studies.

*Infinite Population*

The size of the population has no bearing in the case of infinite populations, and the sample size equations can be reduced to provide the following expressions: Calculation for a proportion:

$$n = \frac{t_\alpha^2 * p * q}{e^2}$$

Calculation for a mean variable

$$n = \frac{t_\alpha^2 * s^2}{e^2}$$

*Observational and Experimental Studies:*

Sample sizes are calculated when comparing two proportions and two means in experimental or observational research. These computations are not affected by the population size N.

*In-case of two proportions:*
In case of comparison of two proportions, for example the percentage of improvement after the vaccine of two different clusters of patients, the formula to estimate the sample size would be

$$n = \frac{\left(t_\alpha * \sqrt{2 * p * q} + t_\beta * \sqrt{p_1 * q_1 + p_2 + q_2}\right)^2}{(p_1 - p_2)}$$

Where, n would be number of patient required per group,
$p_1$ = proportion in the first cluster group. This often comes from prior research, pilot studies, or clinical assumptions.
$p_2$ = proportion in second cluster group, â should be between 10 and 20%.

In – case of comparison of two means
In case – of comparison of two mean, the SS formula would be,

$$n = \frac{2 * s^2 * (t_\alpha + t_\beta)^2}{(\overline{x_1} - \overline{x_2})^2}$$

In essence, this formula helps you determine the minimum number of participants needed in each of two independent groups to detect a specified difference between their means, with a given level of confidence (á) and a desired probability of detecting that difference (power, 1?â), assuming a common variance (s2) across the groups.

In case of more than two groups, proportion Chi-square formula would be applied , furthermore for more than two mean ANOVA formula would be applied for comparing mean of more than two groups, both calculation only available in G-Power software, other software is unable to provide the per group sample size to require the study efficiency.

*Sample size for animal studies:*
For animal studies resource equation method would be applied based on crude method of law of diminishing return. It is employed in situations where it is impossible to estimate the effect size, when many endpoints are measured, when sophisticated statistical procedures are used for analysis, or when it is impossible to estimate the standard deviation in the absence of prior findings. This approach can also be applied in certain exploratory investigations when the researcher's main goal is to identify any degree of variation across groups rather than to verify a hypothesis [13-15].

According to the above mention law a value “E” should be calculated for the sample size of animal studies, which is the degree of freedom of analysis of variance (ANOVA). The value of E must fall within the range of 10 and 20. If E is less than 10, then having more animals will increase the likelihood of getting more meaningful results; but, if E is more than 20, then it won't increase the likelihood. This method can be applied to any animal experiment, regardless of whether it is ANOVA-based. Any sample size that keeps E between 10 and 20 should be considered adequate. The following formula can be used to compute E:

E= Total number of animals – Total number of groups.
This is an easy method but cannot be compared with the power analysis method. Therefore, it is recommended to apply proper formula.

We would like to recommend that researchers include a statement in their publication that explains how they calculated and justified the sample size.

**CONCLUSION**
Calculation of appropriate sample size and power analysis have always a major issue in epidemiological studies and analysis. This article provides the proper guideline for the calculation of sample size during planning and designing the study. Other, more difficult to use software programs14, like MBESS (for social and behavioral sciences) or pwr (calculation of power), can also be used to determine sample size. In any event, we can always compute any sample size in research by either specifying a special function, as we have seen in some circumstances, or by just applying the formula straight from the instructions line.

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**REFERENCES:**

1. Del Águila MR, González-Ramírez AR. Sample size calculation. Allergologia et immune pathologia. 2014;42(5):485-92. DOI: https://doi.org/10.1016/j.aller.2013.03.008.
2. Kleinbaum DG, Kupper LL, Morgenstern H. Epidemiologic research: principles and quantitative methods. John Wiley & Sons. 1991. Weblink: https://books.google.com.pk/books?hl=en&lr=&id.
3. Anderson-Cook CM. Experimental and quasi-experimental designs for generalized causal inference. Weblink: https://www.tandfonline.com/doi/pdf/10.1198/jasa.2005.s22.
4. Obuchowski NA. Receiver operating characteristic curves and their use in radiology. Radiol. 2003;229(1):3-8. DOI: https://pubs.rsna.org/doi/full/10.1148/radiol.2291010898.
5. De Maiois FG, Llovet I, Dinardi G. Latin American perspectives on the sociology of health and illness. 2020. Weblink: https://www.taylorfrancis.com › chapters › edit › introdu.
6. Cohen J. Statistical power analysis for the behavioral sciences. Academic press; 2013. Weblink: https://www.utstat.toronto.edu › CohenPower.
7. Zimmermann FJ. Estadística para Investigadores. Bogotá, D.C., Colombia: Editorial Escuela Colombiana de Ingeniería; 2004. Weblink: https://biblioteca.ucatolica.edu.co/bib/22964.
8. Hajian-Tilaki K. Sample size estimation in diagnostic test studies of biomedical informatics. J biomedic informatic. 2014;48(1):193-204. DOI: https://doi.org/10.1016/j.jbi.2014.02.013.
9. Kang H. Sample size determination and power analysis using the G* Power software. J education evaluat healt professions. 2021;18(1): 1-5. DOI: https://doi.org/10.3352/jeehp.2021.18.17.
10. Ko MJ, Lim CY. General considerations for sample size estimation in animal study. Korean J Anesthesiol. 2021;74(1):23-9. DOI: https://doi.org/10.4097/kja.20662
11. Lakens D. Sample size justification. Collabra: Psychol. 2022;8(1):33267. DOI: https://doi.org/10.1525/collabra.33267.
12. Zhang X, Hartmann P. How to calculate sample size in animal and human studies. Front Med. 2023;10(1): 1-5. DOI: https://doi.org/10.3389/fmed.2023.1215927.
13. Charan J, Kantharia N. How to calculate sample size in animal studies?. J Pharmacol Pharmacotherapeut. 2013;4(4):303-306. DOI: https://doi.org/ 10.4103/0976-500X.1197.
14. Eglen SJ. A quick guide to teaching R programming to computational biology students. PLoS computat biol. 2009;5(8):e1000482. DOI: https://doi.org/ 10.1371/journal.pcbi.1000482.
15. Kang H. Sample size determination and power analysis using the G* Power software. J educat evaluat healt prof. 2021;18(1): 17-23. DOI: https://doi.org/ 10.3352/jeehp.2021.18.17.

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