oAssessing the Prevalence of Attention Deficit Hyperactivity Disorder (ADHD) Symptoms in Undiagnosed Young Adults: A Cross-Sectional study

Aina Marzia Syed [1], Fazeel Nasir [2], Ayesha Shakeel [3], Wajiha Ahmed [3], Rameen Khanzada [4]

Abstract Word Count: 478

ABSTRACT

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder with symptoms such as inattention, hyperactivity, and impulsivity. It often goes undiagnosed, especially in countries with limited mental health awareness like Pakistan.

Methodology

200 participants of age group 18-24 years living in in Karachi, Pakistan were surveyed using the Adult ADHD Self-Report Scale (ASRS) V1.1 and demographic questions. Part A of the questionnaire assessed Attention-deficit and Part B assessed Hyperactivity. Scoring and data analysis was done using SPSS 25, employing descriptive statistics to examine symptom prevalence, associations with mental health perceptions, and stigma's influence on help-seeking behaviour.

Results:

The survey consisted of 140 female participants (70%) and 60 male participants (30%). 47% of participants exhibited inattention symptoms while 37% displayed hyperactivity/impulsivity symptoms. Gender and age did not have a significant influence on symptom scores, although females showed a slightly higher prevalence of both inattention and hyperactivity/impulsivity symptoms compared to males. About 47% of females and 42% of males displayed inattention symptoms, while 50% of females and 33% of males exhibited hyperactivity or impulsivity symptoms. The 18-20 age group consistently exhibited a slightly higher prevalence of symptoms, but this trend was not statistically significant. In the 18-20 age group, 37.9% exceeded the symptom threshold for inattention, while 39.7% surpassed the threshold for hyperactivity or impulsivity symptoms. Stigma was evident as 58% of participants expressed discomfort discussing mental health with family members, while 30% reported discomfort with friends. 41% of participants lacked awareness of ADHD. 76% lacked therapist resources within their educational institutions, and 10% expressed discomfort in seeking psychiatric help.

Conclusion:

Peer support and open mental health discussions within families is needed. Contrary to expectations, it found persistent ADHD symptoms across age groups, challenging the belief in symptom decline with age. Targeted interventions are required to address ADHD symptoms in undiagnosed young adults.

Key Words: ADHD, Attention-deficit hyperactivity disorder, Young Adults, Social Stigma, Pakistan.

.

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is defined as a behavioural condition that leads to difficulty paying attention outside the normal bounds and hyperactive impulsive behaviour [1].

It is a condition that is becoming increasingly common in children. Diagnostic and Statistical Manual of Mental Disorders, version IV, incorporated 'Adult ADHD' into the diagnostic criteria that are difficult to diagnose and recognize [2]. It is diagnosed mainly by the presentation of several specific behaviours noticed by parents in their young children. As mental health awareness spreads, the number of children being diagnosed with ADHD is on the rise [3]. However, in a country like Pakistan, where a vast majority do not possess the knowledge or access to mental healthcare, a great number of children transcend into adulthood undiagnosed, and their symptoms persist and pose a hurdle in their normal day to day life. Due to the lack of mental health awareness and stigma surrounding mental health issues in Pakistan especially amongst the lower socioeconomic classes, children with ADHD are often left undiagnosed and carry on into their adult life unaware of how to manage the disorder [4]. Patients are hesitant to seek mental help due to the fear of being seen as a misfit in society. They also fear being discriminated against socially.

Adults with ADHD often dismiss their symptoms and shortcomings, and this causes to them lead chaotic lifestyles, often leading to substance abuse and difficulty integrating into society [5]. If such individuals lack access to proper mental healthcare, they are more likely to struggle in academics, face unemployment, and display violent behavior. As their academics, social and personal lives grow, undiagnosed ADHD can often lead them to fall behind their classmates, have trouble socialising and fall into a spiral which can often lead to them becoming a misfit in their surroundings [6]. Treatment of adult ADHD leads to an emotionally stable, safer lifestyle, leading to an improved quality of life (e.g., safer driving, reduced criminality) [7]. No figures are available for Pakistan however studies in the West have been conducted. The estimated lifetime prevalence of ADHD in the US. adults aged 18-44 years were 8.1% [8].

ADHD has been found to be highly heritable and influenced by factors such as environmental risk factors and low birth weight. Serious head injuries, meningitis, hydrocephalus, and brain surgery can also increase the risk of developing ADHD [9]. Comorbidity is associated with ADHD, and developmental and learning problems, such as Autistic Spectrum Disorder, speech difficulties, and several psychiatric conditions, often co-occur with ADHD [10].

A timely diagnosis and proper assistance can completely change the trajectory of a young person's life as they ascend into adulthood. It is important to study the exhibition of behavioural patterns indicating ADHD being displayed by young adults dealing with increasing levels of stress and responsibilities [11]. Studies like this have not yet been conducted in Pakistan. Thus, this cross-sectional study aims to fill the gaps and assess the frequency of undiagnosed ADHD among young adults in Pakistan.

Methodology

The aim of this descriptive cross-sectional study was to investigate the potential link between the lack of mental health awareness, access to mental healthcare, and high scores on the Adult ADHD Self-Report Scale (ASRS) V1.1 among young adults in Karachi, Pakistan. The study also sought to compare the results between male, female, and non-binary participants, as well as different age groups (18-20, 20-22, and 22-24 years). The study was conducted after obtaining approval from the Institutional Review Board (IRB) at Jinnah Sindh Medical University.

The participants in this study were young adults between the age bracket of 18-24 years, residing in Karachi, Pakistan. The inclusion criteria comprised individuals within the specified age range and living in the city. Exclusion criteria included participants who had been diagnosed with ADHD, were diagnosed and being

treated for some other mental disorder or previously had chronic anxiety and or depression. The exclusion of coexisting mental disorders enhances clarity in understanding the unique impact of ADHD. Additionally, those residing outside Karachi were excluded from the study. The sample size was determined to be 200 based on the World Health Organization (WHO) calculator, using a 5% margin of error and a 95% confidence interval.

Data collection for this study was conducted using an online survey hosted on the Google Forms platform. To ensure an efficient and widespread distribution of the survey, researchers utilized various digital platforms, including social media, university mailing lists, and online community forums. The survey link was shared with the target audience, which consisted of young adults aged 18-24 residing in Karachi, Pakistan.

The online survey was designed to be user-friendly and accessible across different devices, such as computers, tablets, and smartphones. Participants could access the survey at their convenience, enabling them to respond to the questionnaire at a time and location of their choosing. This approach aimed to maximize participation and gather responses from a diverse and representative sample of the target population.

Before beginning the survey, participants were provided with a clear and concise introduction that outlined the study's objectives, assured data confidentiality, and emphasized the voluntary nature of their participation and their informed consent was taken. This ensured ethical compliance throughout the data collection process.

The questionnaire utilized in this study was meticulously developed to comprehensively assess various aspects related to ADHD symptoms, mental health awareness, access to mental healthcare, and perceptions about psychiatric diagnoses among young adults aged 18-24 residing in Karachi, Pakistan. It consisted of two main sections: demographic information and additional questions, followed by the ADHD Self-Report Scale (ASRS) V1.1.

The demographic section collected essential information about the participants, including their gender, with response options for Male, Female, or Non-binary, and their age, categorized into three brackets: 18-20, 21-22, and 22-24 years.

The additional questions aimed to delve deeper into the participants' mental health status and perceptions. They inquired about any prior diagnoses of specific mental health conditions, such as Anxiety, Depression, Bipolar Disorder, and obsessive-compulsive disorder. Participants were asked to assess their comfort level in discussing mental health issues with both their family and friends, using a rating scale ranging from "Very Comfortable" to "Very Uncomfortable." They were also questioned about their beliefs concerning whether a psychiatric diagnosis might unfairly limit their career prospects and other areas.

Moreover, participants were asked about their knowledge of ADHD, with response options for "Yes," "No," or "I have a vague idea." Additionally, they were inquired whether they had ever accessed therapists at their past or current educational institute, with response options of "Yes" or "No."

The centerpiece of the questionnaire was the ADHD Self-Report Scale (ASRS) V1.1. This scale consisted of 18 items and served to evaluate ADHD symptoms in adults aged 18 and above. It was adapted from the World Health Organization Composite International Diagnostic Interview and aligned with the DSM criteria for ADHD in adults. The ASRS consisted of two parts, Part A and Part B. Part A comprised the first six questions (items 1-6). Participants were asked to rate how often they experienced certain ADHD

symptoms, ranging from "Never" to "Very Often." A score of 4 or more on Part A indicated a symptom profile similar to that of an adult with ADHD.

Part B of the ASRS consisted of the next 12 questions (items 7-18). This section provided additional cues and probes into the severity and impact of inattention or hyperactivity symptoms on participants' lives. Participants provided frequency scores for each item to aid in further evaluation.

The questionnaire encompassed a comprehensive assessment tool, combining demographic information, supplementary questions, and the ASRS, to thoroughly explore the link between mental health awareness, access to mental healthcare, and high scores on the ADHD Self-Report Scale among different age groups and genders in Karachi, Pakistan.

Data Analysis:

The scoring of the ASRS V1.1 questionnaire involved assigning points to each item based on participants' responses. "For Part A, items 1 to 6 were evaluated using a range of 0 to 6, where responses of 'Never' received 0 points, 'Rarely' received 1 point, 'Sometimes' received 2 points, 'Often' received 3 points, and 'Very Often' received 4 points. Participants who scored 4 or more in Part A were identified as having a symptom profile similar to that on an adult with ADHD.

Similarly, for Part B, items 7 to 18 were evaluated using a scale that ranged from 0 to 6, with "Never" receiving 0 points, "Rarely" receiving 1 point, "Sometimes" receiving 2 points, "Often" receiving 3 points, and "Very Often" receiving 4 points. The total score for Part B ranged from 0 to 12. Participants who scored 6 or more in Part B were considered to have more severe hyperactivity or impulsivity symptoms.

Additionally, a total score was calculated by summing the scores from both Part A and Part B, resulting in a range of 0 to 18. The total score was then converted into a percentile, providing context for each participant's responses compared to normative data from 22,397 adults. A percentile of 90, for example, showed that the participant outperformed 90 percent of other average adults their age.

The collected data were entered into SPSS 25 for statistical processing and underwent comprehensive statistical analysis to address the research questions. Firstly, the male-female-nonbinary ratio was calculated to understand the distribution of gender among participants. The percentage of participants in each age group (18-20, 21-22, and 22-24 years) was determined to examine the age distribution.

Further analysis included cross-tabulations to examine associations between inattention and hyperactivity symptoms and variables related to mental health awareness and access to mental healthcare.

The number of participants who scored 4 or more in Part A and 6 or more in Part B was computed. This provided insight into the prevalence of ADHD-like symptoms among research participants. Further analysis involved exploring associations between symptom scores and participants' responses to specific questions. For instance, the study calculated how many participants who scored 4 or more in Part A also answered 'Very uncomfortable' on questions 4 and 5

Furthermore, the study analyzed how many participants who scored 4 or more in Part A answered "No" or "Vague Idea" on question 7, assessing their familiarity with ADHD. Question 6 inquired about whether the participant felt a diagnosis would hinder their career.

The data analysis extended to investigating participants' comfort levels in seeing a psychiatrist if needed (question 9). Specifically, the study calculated the number of participants who answered, "Very Uncomfortable" and "Uncomfortable" on question 9 to gauge potential barriers to seeking mental health care. It also calculated how many participants answered "Yes" on question 8, which inquired about the availability of therapists at their educational institute.

To explore associations between inattention and hyperactivity symptoms with mental health awareness and access to mental healthcare, Chi-square tests were employed. To measure the degree of relationship, the Phi correlation coefficient was calculated, with a significance level set at $P < 0.05$ to identify statistically significant associations.

Throughout the data analysis process, appropriate statistical methods were used to provide meaningful insights into the relationships between lack of mental health awareness, access to mental healthcare, and high scores on the ASRS, while accounting for potential demographic variations among the study participants.

Ethical Considerations:

Throughout the research process, strict adherence to ethical guidelines was paramount to ensure the protection, rights, and well-being of the participants. The study was carried out in compliance with the principles mentioned in the Helsinki Declaration and the procedures established by the researchers' institution's Institutional Review Board (IRB). Prior to data collection, every participant provided informed consent. Each participant had been informed of the explicit descriptions of the study's aims, the voluntary nature of participation, confidentiality assurances, and the ability to withdraw at any time without consequence. Participants were specifically assured that their personal information and replies would be kept completely confidential and would only be available to the research team.

To minimize potential biases and ensure the validity and reliability of the findings, several measures were implemented throughout the study. Firstly, the sampling technique employed was non-probability convenient sampling, allowing participants to voluntarily respond to the survey. To reduce selection bias, the research team made diligent efforts to disseminate the survey across diverse digital platforms, targeting a wide range of young adults residing in Karachi.

Moreover, the survey design itself aimed to be impartial and unbiased. The questionnaire, including the ADHD ASRS and additional questions, was meticulously constructed to be clear, objective, and free from leading or suggestive language. The response options for each question were carefully structured to avoid any inherent bias. The research team-maintained vigilance against potential researcher bias during the data collection and analysis process. Steps were taken to remain neutral and objective, ensuring that personal beliefs or opinions did not influence the interpretation of the results.

Furthermore, data privacy and confidentiality were given utmost importance to protect the identity and sensitive information of the participants. Access to the survey responses and the data collected was limited to authorized members of the research team, ensuring that participant anonymity was preserved.

By adhering to rigorous ethical guidelines and implementing measures to minimize bias, the study aimed to maintain the highest standards of integrity, respect for participants' autonomy, and the validity of the research findings.

Results

Participant Demographics and Gender Distribution:
The investigation into the frequency of undiagnosed ADHD among young adults in Karachi, Pakistan, unfolded with the participation of 200 diverse individuals. This cohort composition allowed for a comprehensive exploration of the subject matter. Notably, gender distribution within the sample was balanced, with 70% women who participated (n=140) and 30% men who participated (n=60), ensuring a robust representation of both sexes.

Gender-Stratified Analysis of Scores Related to ADHD:
Among the 140 female participants, 64 individuals (45.7%) exhibited symptoms exceeding the threshold of 4 in Part A of the scores derived from the ADHD Self-Report Scale (ASRS) V1.1. In comparison, among the 60 male participants, 25 individuals (41.7%) showcased similar inattention symptoms. This slight numerical difference suggests a marginally higher prevalence of inattention symptoms among female participants. In Part B of the ASRS, 70 females (50%) surpassed the threshold of 6, indicating heightened hyperactivity or impulsivity symptoms. Comparatively, 20 males (33.3%) exhibited symptoms surpassing 6 in Part B. This discrepancy suggests that females displayed a more prominent tendency toward hyperactivity or impulsivity symptoms in this context. As seen in **Figure 2**, for both gender pf participants, the mean score in Part A of the ADHD Self-Report Scale (ASRS) was 3.38, reflecting a certain proclivity towards inattention symptoms. Additionally, the mean score for males in Part B was 5.38 compared to 5.1 for females indicative of a propensity for more pronounced hyperactivity or impulsivity traits. The cumulative total mean score for women was 8.76. Conversely, male participants showcased slightly lower scores, with a cumulative total mean of 8.36. Independent t-tests revealed no statistically significant gender differences in symptom scores (Part A: $t=-0.854$, $p=0.394$; Part B: $t=-1.071$, $p=0.286$; Total: $t=-0.781$, $p=0.436$), highlighting gender parity in ADHD symptom expression.

Age-Stratified Exploration of Symptom Prevalence:
The distribution of participants across distinct age brackets and its influence on the prevalence of ADHD symptoms within the studied cohort became a significant point of investigation. To comprehensively explore this relationship, a Chi-square test for independence was applied. Among the participants, a substantial 69% belonged to the dynamic 18-20 age range, signifying the early stages of adulthood. The subsequent age bracket, comprising 21–22-year-olds, constituted 24%, while the oldest age group, spanning 22-24 years, accounted for 7% of the participants.

Upon delving further, the interplay between gender and age underscored these trends. Among females, a significant 70% were situated within the 18-20 age range, whereas 22% fell into the 21-22 age group, and 7.1% belonged to the 22-24 age group. Similarly, for males, the distribution encompassed 65% (18-20 age group), 28.3% (21-22 age group), and 6.7% (22-24 age group). The notable prevalence of the 18-20 age group persisted consistently across both genders.

The Chi-square test for independence aimed to ascertain the correlation between age groups and the proportion of participants exceeding symptom thresholds. Within the context of age groups, the pivotal role of age in influencing ADHD symptom prevalence was illuminated. In the 18-20 age group, 59 participants, representing 37.9%, surpassed the threshold of 4 in Part A. This number stood at 29 for the 21-22 age group (36.7%), and 6 for the 22-24 age group (27.3%). Similarly, in Part B, 62 participants in the 18-20 age group (39.7%), 23 in the 21-22 age group (29.1%), and 6 in the 22-24 age group (27.3%) surpassed the threshold of 6.

The Chi-square test for independence evaluated the observed distribution of participants across age groups against the assumption of independence between age groups and symptom prevalence. The results

indicated that age did not exert a statistically significant influence on the prevalence of ADHD symptoms among the studied cohort (Part A: χ^2=1.429, p=0.489; Part B: χ^2=0.572, p=0.751). This insight underscores the consistent prevalence of symptoms across the different age groups.

Correlation Assessment:
Upon exploration, no statistically significant correlation was established between age and ADHD symptoms (Pearson correlation measure r = 0.112, p = 0.116). While age is a crucial dimension, this implies that other intricate factors contribute to the presentation of ADHD symptoms among adolescents.

Comprehensions of Mental Health and Knowledge of ADHD:
Varying appreciations of psychological wellness within the context of ADHD were reflected, and participants expressed their apprehensiveness when discussing internal health across an assortment of degrees. In response to the question 'How comfortable would you feel talking about your internal health with your family?', 58 participants chose 'Very Uncomfortable,' while 30 participants chose the same response for conversations with friends. Chi-square tests demonstrated a significant association between comfort in discussing psychological health with family and age ($\chi^2 = 9.568$, $p = 0.008$), disclosing that younger participants were more likely to feel uncomfortable.

Likewise, the review uncovered an information gap, with 82 participants responding that they had limited knowledge or a vague awareness of ADHD. Age didn't predict knowledge levels, as was supported by the logistic regression analysis that there was no revelatory association between knowledge of ADHD and age ($\beta = -0.063$, $p = 0.284$).

Availability of Therapeutic Resources and Obstacles to Seeking Help:
Delving into the availability of therapeutic resources revealed a concerning trend, with 152 participants indicating a lack of inaccessibility of therapists at their educational institutes. This underscores implicit gaps in mental health support within educational settings. Strikingly, 19 participants expressed apprehension at the prospect of seeking psychiatric aid, as substantiated by their response to the question 'How comfortable would you feel seeing a psychiatrist if you felt the need?'

Discussion

3.1 Demographic Insights: Influence of Age on Survey Participation and ADHD Symptomatology

As seen in **Figure 1**, the sample consisted predominantly of new adults and university students as 69% of the total participants lie in the age range of 18-20 years, 24% fall between the ages 21-22, and only 7% are between the ages of 22-24. Following a similar pattern, the majority of responses across both genders came from the age bracket 18-20. (It was observed that out of a total of 60 male participants, 65% also belonged to the 18-20 age group. Furthermore, out of a total of 140 female participants, 70% of women who responded also fall in the 18-20 age group.) This observation suggests a potential influence of the

investigators' age group, indicating a higher reach and approachability towards females in the 18-20 category Additionally, this shows that females in this age group were more approachable and forthcoming towards the topic and displayed an overall higher percentage of willingness to participate in the study. This trend supports previous findings that women have been reported as more likely to participate in surveys and research studies [12].

In part A of the questionnaire, 94 people scored above 4. Indicating a strong level of agreement/relatability with inattention and focus-related symptoms of ADHD. Similarly, an almost equal number of participants surpassed the threshold of 6 for part B which targeted hyperactivity and impulsivity-related symptoms. Although, as prefrontal cortex development nears completion towards the mid and late 20s, general adolescent impulsivity and other behavioral and psychosocial problems tend to show a gradual decline. A greater sense of prioritization, compartmentalization, and the general ability to manage day-to-day stresses is observed to show a consistent increase before physiological/age-related physical and cognitive decline begins. This remains consistent with the reduction in the frequency of people who self-report or get diagnosed with ADHD as adults [13].

There is no significant statistically significant connection between age and the prevalence of ADHD symptoms since symptoms prevail consistently across all age groups as a similar amount of people surpassed the threshold of 6 for part B which targeted hyperactivity and impulsivity-related symptoms.

3.2 Gender Disparities in ADHD Scores

As seen in **Figure 3, t**he percentage of female participants who scored more than 4 in Part A (45.7%) was higher than the percentage of their male counterparts who scored more than 4 in Part A (41.6%). This result is statistically insignificant. However, females showing a higher frequency is not consistent with other studies. A similar study was conducted to assess ADHD in Pakistani medical students and found that male students showed a higher frequency compared to female students [27].According to a National Comorbidity Survey, males (5.4%) were more likely to have ADHD than females (3.5%)[28].However, these statistics may be because females are less likely to show externalizing behaviors and are thus less likely to be diagnosed. The available evidence also indicates that women are less inclined than men to display typical ADHD symptoms, such as acting impulsively and disruptively [29, 30]. However, there is still little information on how sex/gender and immunology affect neurodevelopmental disorders [31]. The correlation of gender with ADHD has not been fully investigated and future studies should explore this further.

3.3 Social Support Dynamics and Familial Challenges in Mental Health Disclosure

The role of a strong social support system in the recovery of psychiatric patients plays a quintessential role in preventing relapses and encouraging recovery [14]. Participants expressed their hesitance and reservations when asked if they would be comfortable opening up to their families and friends about their mental health struggles. However, seeking support from among friends was given preference over seeking support from family members as evidenced by 58 responses for “very uncomfortable” when discussing mental health with their families in contrast to only 30 responses choosing the same when given the choice of discussing their mental health with their friends.

It is notably more consequential to involve family members with challenges in mental wellness, there are more financial and social implications for the families of those caring for people who struggle with their mental well-being [15]. Due to the stigma surrounding mental health and the apprehension of facing rejection within the context of a joint family structure, children with developmental problems in Pakistan reported considerable levels of self-stigmatization. They may hesitate to open up to others due to the possibility of judgment and labels that often accompany it [16.] Individuals who expressed discomfort when

talking to their loved ones about their mental health were more likely to have ADHD symptoms. This indicates that mental health stigma and fear of rejection remain one of the reasons behind their undiagnosed ADHD.

It is understandable that people do not wish to strain the limited resources present at home and to shelter their caregivers from the implications of such a diagnosis or self-admittance [17].There are fewer practical and long-term consequences when reaching out to friends since the support given and asked for does not impact as many aspects of the lives of those reaching out and those providing help. Additionally, there may be religious reservations and their social repercussions that discourage those in need to reach out i.e. the widespread lack of awareness of ADHD and other psychiatric disorders which leads to inadequacy in providing support and patient care outside of related healthcare and wellness centers. These individuals also scored more than 4 in Part A. This indicates that mental health stigma and fear of rejection remain one of the reasons behind undiagnosed ADHD.

3.4 The Pervasive Lack of ADHD Awareness and Implications for Stigmatization and Educational Gaps

82 participants had a "vague" or "no" idea about ADHD. This also fuels the stigmatization and largescale prejudice toward those personally seeking help for mental health-related concerns or clinically diagnosed with ADHD or one of its comorbidities thus perpetuating the issue of misrepresentation. The lack of knowledge and awareness about ADHD has significant implications for individuals seeking help for mental health-related concerns or those clinically diagnosed with ADHD.

Research has shown that there are substantial gaps in understanding ADHD, particularly among certain demographic groups. For instance, studies have reported that men, individuals from non-white ethnic backgrounds, and older people have the largest gaps in knowledge about ADHD [18]. Caregivers of children with ADHD have been found to hold various misconceptions about the etiologies of this disorder [19]. This lack of understanding extends to teachers as well, with studies indicating that practicing teachers and undergraduate education students have significant gaps in knowledge and attitudes about ADHD [20]. This can result in inadequate support and a less inclusive learning environment for students with ADHD. Insufficient knowledge may lead to challenges in providing tailored interventions, potentially contributing to misunderstandings and stigma within educational settings. Comprehensive training is essential to address these knowledge gaps, fostering a more supportive and empathetic environment for students with ADHD.

Additionally, misconceptions about ADHD have been found to persist among the public, with a substantial portion of participants expressing reluctance towards pharmacological treatment for ADHD [21]. These misconceptions and lack of awareness contribute to stigmatizing experiences reported by children with ADHD and their parents. Insufficient understanding and expertise in the management of ADHD among general practitioners has been identified as a notable barrier to implementing effective ADHD programs in pediatric settings [22]. The pervasive lack of knowledge and misconceptions about ADHD among various groups, including caregivers, teachers, and the public, underscores the urgent need for targeted educational initiatives and interventions to address these issues and reduce the stigma associated with ADHD.

3.5 Psychiatric Engagement Challenges in Evolving Mental Health Dynamics and Systemic Complexities

The results indicated that 19 people felt they would feel "very uncomfortable" seeing a psychiatrist. This is directly related to the aforementioned factors. On the contrary, this low turnover is supportive of the fact that there has been a change in attitudes toward ADHD and mental disorders among the newer generations, especially in the literate population.

Mental health is usually the last to be addressed, as the greater population has not been educated about what it means and how to deal with challenges that arise. Often, we are taught to push away unpleasant thoughts, feelings, experiences, and sensations instead of addressing them. There is also a known scarcity of mental health professionals and experts in the country [23]. Out of 200, 152 participants did not have a therapist made available in their educational institutions. In a developing country such as Pakistan, the availability of allied specialist services is limited. This challenge is further exacerbated by a lack of awareness among parents, teachers, and health professionals. This is evident in the low rates of referrals from schools[24]. As a result of this lack of support, young adults with ADHD are more prone to experiencing mental health problems, substance abuse problems, academic difficulties, drop out of school, to be unemployed, and to have a criminal record than young adults without ADHD[25], [26].

92 participants chose 'YES' on Question 6: Do you believe a psychiatric diagnosis would unfairly limit your chances in your career and otherwise? Due to the stigma and lack of awareness about ADHD, Pakistan does not have a system that accommodates people with ADHD. Participants fear that they may get discriminated against and or have limited job opportunities. Individuals with ADHD are often stereotyped to be irresponsible and unreliable. ADHD symptoms are often perceived as character weakness, unreliability, immaturity, impoliteness and emotional dysfunctionality [32]. This perception may cause employers to be less likely to hire people diagnosed with ADHD.

3.6 Pharmacological Interventions in ADHD: Efficacy and Treatment Outcomes

Attention-Deficit/Hyperactivity Disorder (ADHD) poses persistent challenges across the lifespan of those affected, and medication has emerged as a vital element in its comprehensive management. Notably, individuals who consistently adhere to ADHD medication regimens experience significantly better academic, employment, and social outcomes compared to non-medicated counterparts[33]. This underscores the substantial, long-term advantages associated with the sustained use of medication, indicating its positive impact on diverse aspects of life.

Based on the studies, subsequent monitoring of children treated for combined type ADHD in a multisite study revealed that medication management and behavior therapy were effective in reducing ADHD symptoms [34,35]. Additionally there is evidence supporting periodic evaluation of discontinuing medication trials to assess ongoing necessity [36]. Pharmacological treatments, such as psychostimulants, have been indicated to be effective in addressing the fundamental symptoms of ADHD and reducing the risk of injuries requiring hospitalization [37,38]. Moreover, medications have demonstrated efficacy in alleviating ADHD symptoms in children with pervasive developmental disorders [39]. Variables like parental beliefs and attitudes toward treatment have been linked to the initiation and sustained use of ADHD medication[40]. Therefore, the effectiveness of stimulant medication in diminishing ADHD symptomatology among individuals diagnosed with ADHD has been confirmed [41].

It is vital to educate and raise awareness to establish a safe and accommodating environment for people diagnosed with ADHD so that they may receive the treatment and care that they require. Stigma is frequently combated by means of education [42],[43]. This will make individuals more willing to get a screening done early in life enabling them to reach their full potential.

Limitations:

This study offers a crucial glimpse into the frequency of undiagnosed ADHD among young adults in Karachi, Pakistan. However, it's important to acknowledge certain limitations that could impact the interpretation of the findings.

The reliance on self-reported data presents a potential source of bias. Participants may exhibit recall bias or social desirability bias, potentially affecting the accuracy of reported ADHD symptoms and mental health perceptions. This might lead to an underestimation or overestimation of the true prevalence and severity of symptoms.

The DSM-IV-TR criteria for diagnosing ADHD have limitations, particularly in their applicability to young adults and college students. The current diagnostic criteria, although more suitable for school-age children, may not adequately capture developmental changes in the expression of core symptoms. It's noteworthy that young adults, including college students, might exhibit significant ADHD symptomatology compared to their peers of the same age without meeting the DSM-IV diagnostic criteria [44]. Another methodological limitation is that studies on ADHD in college students have had small convenience sampling and due to the self-reporting technique employed it could not be determined whether students qualify for an ADHD diagnosis or not, thus an accurate estimate of ADHD cannot be attained.

Consistent methods with clinical support and full diagnostic criteria should be used to counter this, however, such a study would entail greater investments of time and other resources. Furthermore, symptomatology in adults with ADHD does not manifest in the same manner as it does in children, and most of the diagnostic criteria are better tailored for pediatric diagnosis rather than for adult ADHD.

Addressing these potential biases and limitations, several measures were implemented to enhance the data quality. Participants were given clear and concise instructions, underscoring the significance of providing honest and accurate responses. Participants were assured of anonymity and confidentiality to foster a climate that encourages the provision of truthful information.

Furthermore, the survey distribution spanned various digital platforms, aiming to capture a more diverse range of participants and minimize selection bias. The questionnaire's design was meticulously crafted to minimize leading questions and suggestive language. Standardized scales, such as the ADHD ASRS, were utilized to improve the reliability of symptom assessment. Ethical considerations were meticulously upheld throughout the study. The study adhered to informed consent procedures, ensuring that participants were thoroughly briefed on the study's purpose and their rights.

Conclusion

The findings show the complex interplay of factors related to ADHD symptoms, such as gender, age, mental health awareness, stigma, and access to care. The study's implications provide helpful insights for developing targeted therapies. Initiatives to raise mental health awareness and destigmatize mental illness are critical. We can establish safe spaces for young adults to seek treatment without fear of judgement or discrimination if we foster an environment that supports open dialogues about mental health. Collaboration between educational institutions, healthcare providers, and the community can help to create this conducive environment. While this study gives useful insights, it also recommends areas for additional research. Future studies could go deeper into identifying the unique obstacles that different age groups and genders confront. Investigating the efficacy of awareness campaigns, mental health support structures, and focused interventions can help to refine ways for dealing with undiagnosed ADHD.

Longitudinal studies that follow individuals over time can also provide a more comprehensive knowledge of how ADHD symptoms grow and are influenced by numerous factors. Incorporating clinical tests alongside self-reported data can improve diagnostic accuracy while also shedding light on any associated diseases that may effect ADHD symptoms.

1. NIMH » Attention-Deficit/Hyperactivity Disorder. Accessed March 4, 2023. https://www.nimh.nih.gov/health/topics/attention-deficit-hyperactivity-disorder-adhd

2. Segal DL. Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR). *The Corsini Encyclopedia of Psychology*. Published online January 30, 2010:1-3. doi:10.1002/9780470479216.CORPSY0271

3. Xu G, Strathearn L, Liu B, Yang B, Bao W. Twenty-Year Trends in Diagnosed Attention-Deficit/Hyperactivity Disorder Among US Children and Adolescents, 1997-2016. *JAMA Netw Open*. 2018;1(4). doi:10.1001/JAMANETWORKOPEN.2018.1471

4. Majeed MH, Mumtaz A, Arooj S, Afzal MY. Pakistan's lack of mental health services for children: Failing the future. *Asian J Psychiatr*. 2018;36:34-35. doi:10.1016/J.AJP.2018.06.005

5. Harstad E, Levy S, Ammerman SD, et al. Attention-deficit/hyperactivity disorder and substance abuse. *Pediatrics*. 2014;134(1). doi:10.1542/PEDS.2014-0992

6. Bjerrum MB, Pedersen PU, Larsen P. Living with symptoms of attention deficit hyperactivity disorder in adulthood: a systematic review of qualitative evidence. *JBI Database System Rev Implement Rep*. 2017;15(4):1080-1153. doi:10.11124/JBISRIR-2017-003357

7. Küpper T, Haavik J, Drexler H, et al. The negative impact of attention-deficit/hyperactivity disorder on occupational health in adults and adolescents. *Int Arch Occup Environ Health*. 2012;85(8):837-847. doi:10.1007/S00420-012-0794-0/METRICS

8. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. *Diagnostic and Statistical Manual of Mental Disorders*. Published online May 22, 2013. doi:10.1176/APPI.BOOKS.9780890425596

9. Banerjee T Das, Middleton F, Faraone S V. Environmental risk factors for attention-deficit hyperactivity disorder. *Acta Paediatr*. 2007;96(9):1269-1274. doi:10.1111/J.1651-2227.2007.00430.X

10. Katzman MA, Bilkey TS, Chokka PR, Fallu A, Klassen LJ. Adult ADHD and comorbid disorders: clinical implications of a dimensional approach. *BMC Psychiatry*. 2017;17(1). doi:10.1186/S12888-017-1463-3

11. NICE. Attention deficit hyperactivity disorder: diagnosis and management. *National Institute for Health and Clinical Excellence*. 2019;(September 2019):62. Accessed March 4, 2023. https://www.ncbi.nlm.nih.gov/books/NBK493361/

12. Becker R. Dynamic Analysis of the Timing of Survey Participation: An Application of Event History Analysis of the Stochastic Process of Response in a Probability-Based Multi-Wave Panel With Computer-Assisted Interview Modes. *https://doi.org/101177/08944393231183871*. Published online June 14, 2023. doi:10.1177/08944393231183871

13. Vos M, Hartman CA. The decreasing prevalence of ADHD across the adult lifespan confirmed. *J Glob Health*. 2022;12. doi:10.7189/JOGH.12.03024

14. Mokgothu MC, Du Plessis E, Koen MP. The strengths of families in supporting mentally-ill family members. *Curationis*. 2015;38(1). doi:10.4102/CURATIONIS.V38I1.1258

15. Hughes D. *Families Coping with Mental Illness: Looking at Phases of Grief over Time*.; 2005. Accessed August 24, 2023. https://search.proquest.com/openview/39f88532b3a72761b6cc095e8ad40130/1?pq-origsite=gscholar&cbl=18750&diss=y

16. Khalil A, Gondal F, Imran N, Azeem MW. Self-Stigmatization in children receiving mental health treatment in Lahore, Pakistan. *Asian J Psychiatr*. 2020;47. doi:10.1016/J.AJP.2019.10.019

17. Aass LK, Skundberg-Kletthagen H, Schrøder A, Moen ØL. Young Adults and Their Families Living With Mental Illness: Evaluation of the Usefulness of Family-Centered Support Conversations in Community Mental Health care Settings. *J Fam Nurs*. 2020;26(4):302-314. doi:10.1177/1074840720964397

18. Mueller AK, Fuermaier ABM, Koerts J, Tucha L. Stigma in attention deficit hyperactivity disorder. *Atten Defic Hyperact Disord*. 2012;4(3):101. doi:10.1007/S12402-012-0085-3

19. Chou WJ, Liu TL, Hsiao RC, Chen YM, Chang CC, Yen CF. Caregiver-Attributed Etiologies of Children's Attention-Deficit/Hyperactivity Disorder: A Study in Taiwan. *Int J Environ Res Public Health*. 2020;17(5). doi:10.3390/IJERPH17051652

20. Bekle B. Knowledge and attitudes about attention-deficit hyperactivity disorder (ADHD): a comparison between practicing teachers and undergraduate education students. *J Atten Disord*. 2004;7(3):151-161. doi:10.1177/108705470400700303

21. Korean public knowledge and perceptions about treatment of attention-deficit hyperactivity disorder - EM consulte. Accessed November 25, 2023. https://www.em-consulte.com/article/1126194/korean-public-knowledge-and-perceptions-about-trea

22. Bahraini S, Maisonneuve A, Wu D, et al. Barriers and Facilitators to Implementing a Canadian Shared-Care ADHD Program in Pediatric Settings in Shanghai: A Consolidated Framework for Implementation Research Approach. Published online July 10, 2023. doi:10.21203/RS.3.RS-3136069/V1

23. Siddiqui F, Khan Q ul ain. Barriers and Challenges to Mental Health Care in Pakistan. *Pakistan Journal of Neurological Sciences (PJNS)*. 2021;16(3). Accessed August 24, 2023. https://ecommons.aku.edu/pjns/vol16/iss3/1

24. Frequency, Clinical characteristics and comorbidities of Attention Deficit Hyperactivity Disorder presenting to a Child psychiatric clinic at a University hospital in Pakistan. Accessed August 24, 2023. http://www.jpps.com.pk/article/frequencyclinicalcharacteristicsandcomorbiditiesofattentiondeficithyperactivitydisorderpresentingtoachildpsychiatricclinicatauniversityhospitalinpakistan_2277.html

25. Miranda A, Colomer C, Berenguer C, Roselló R, Roselló B. Substance use in young adults with ADHD: Comorbidity and symptoms of inattention and hyperactivity/impulsivity. *Int J Clin Health Psychol*. 2016;16(2):157. doi:10.1016/J.IJCHP.2015.09.001

26. Engelhardt PE, Nobes G, Pischedda S. The Relationship between Adult Symptoms of Attention-Deficit/Hyperactivity Disorder and Criminogenic Cognitions. *Brain Sci*. 2019;9(6). doi:10.3390/BRAINSCI9060128

27. Hamid A, Shahzad T, Faridi S, Nadeem A. Frequency of behavioural tendencies resembling attention-deficit hyperactivity disorders in undergraduate medical students: a cross sectional study. *J Pak Med Assoc*. 2020;70(9):1671-1675. doi:10.5455/JPMA.35012

28. Fayyad J, Sampson NA, Hwang I, et al. The descriptive epidemiology of DSM-IV Adult ADHD in the World Health Organization World Mental Health Surveys. *Atten Defic Hyperact Disord*. 2017;9(1):47-65. doi:10.1007/S12402-016-0208-3

29. Young S, Adamo N, Ásgeirsdóttir BB, et al. Females with ADHD: An expert consensus statement taking a lifespan approach providing guidance for the identification and treatment of attention-deficit/ hyperactivity disorder in girls and women. *BMC Psychiatry*. 2020;20(1). doi:10.1186/S12888-020-02707-9

30. Majeed MH, Mumtaz A, Arooj S, Afzal MY. Pakistan's lack of mental health services for children: Failing the future. *Asian J Psychiatr*. 2018;36:34-35. doi:10.1016/J.AJP.2018.06.005

31. Bölte S, Neufeld J, Marschik PB, Williams ZJ, Gallagher L, Lai MC. Sex and gender in neurodevelopmental conditions. *Nat Rev Neurol*. 2023;19(3):136-159. doi:10.1038/S41582-023-00774-6

32. Masuch TV, Bea M, Alm B, Deibler P, Sobanski E. Internalized stigma, anticipated discrimination and perceived public stigma in adults with ADHD. *Atten Defic Hyperact Disord*. 2019;11(2):211-220. doi:10.1007/S12402-018-0274-9

33. Charach A, Fernandez R. Enhancing ADHD Medication Adherence: Challenges and Opportunities. *Curr Psychiatry Rep*. 2013;15(7). doi:10.1007/S11920-013-0371-6

34. Molina BSG, Hinshaw SP, Swanson JM, et al. The MTA at 8 years: prospective follow-up of children treated for combined-type ADHD in a multisite study. *J Am Acad Child Adolesc Psychiatry*. 2009;48(5):484-500. doi:10.1097/CHI.0B013E31819C23D0

35. Jensen PS. A 14-month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. The MTA Cooperative Group. Multimodal Treatment Study of Children with ADHD. *Arch Gen Psychiatry*. 1999;56(12):1073-1086. doi:10.1001/ARCHPSYC.56.12.1073

36. Lohr WD, Wanta JW, Baker M, et al. Intentional Discontinuation of Psychostimulants Used to Treat ADHD in Youth: A Review and Analysis. *Front Psychiatry*. 2021;12. doi:10.3389/FPSYT.2021.642798

37. Pai MS, Yang SN, Chu CM, Lan TY. Risk of injuries requiring hospitalization in attention deficit hyperactivity disorder and the preventive effects of medication. *Psychiatry Clin Neurosci*. 2022;76(12):652-658. doi:10.1111/PCN.13471

38. Mulqueen JM, Bartley CA, Bloch MH. Meta-analysis: parental interventions for preschool ADHD. *J Atten Disord*. 2015;19(2):118-124. doi:10.1177/1087054713504135

39. Reichow B, Volkmar FR, Bloch MH. Systematic Review and Meta-Analysis of Pharmacological Treatment of the Symptoms of Attention-Deficit/Hyperactivity Disorder in Children with Pervasive Developmental Disorders. *J Autism Dev Disord*. 2013;43(10):2435. doi:10.1007/S10803-013-1793-Z

40. Kamimura-Nishimura KI, Brinkman WB, Epstein JN, et al. Predictors of Stimulant Medication Continuity in Children with Attention-Deficit/Hyperactivity Disorder. *Journal of Developmental and Behavioral Pediatrics*. 2022;43(6):311-319. doi:10.1097/DBP.0000000000001074

41. Epstein JN, Langberg JM, Lichtenstein PK, et al. Attention-deficit/hyperactivity disorder outcomes for children treated in community-based pediatric settings. *Arch Pediatr Adolesc Med*. 2010;164(2):160-165. doi:10.1001/ARCHPEDIATRICS.2009.263

42. Rüsch N, Angermeyer MC, Corrigan PW. Mental illness stigma: concepts, consequences, and initiatives to reduce stigma. *Eur Psychiatry*. 2005;20(8):529-539. doi:10.1016/J.EURPSY.2005.04.004

43. Morgan AJ, Reavley NJ, Ross A, Too LS, Jorm AF. Interventions to reduce stigma towards people with severe mental illness: Systematic review and meta-analysis. *J Psychiatr Res*. 2018;103:120-133. doi:10.1016/J.JPSYCHIRES.2018.05.017

44. Green AL, Rabiner DL. What Do We Really Know about ADHD in College Students? *Neurotherapeutics*. 2012;9(3):559. doi:10.1007/S13311-012-0127-8

Tables and figures

Table 1

Demographic Characteristics	**Female Participants (n=140)**	**Male Participants (n=60)**	**Total (n=200)**
Mean Age (years)	18-20	18-20	18-20
Age Groups (%)			
- 18-20	70.7%	65%	69.0%
- 21-22	22.1%	28.3%	24.0%
-22-24	7.1%	6.7%	7.0%
ASRS V1.1 scores. (%)	**Female Participants (n=140)**	**Male Participants (n=60)**	
- Part A (Mean)	3.38 (SD: 1.20)	3.38 (SD: 1.20)	3.34 (SD: 1.21)
- Part B (Mean)	5.38 (SD: 1.49)	5.10 (SD: 1.45)	5.28 (SD: 1.47)
- Total Score (Mean)	8.76 (SD: 2.47)	8.36 (SD: 2.37)	8.62 (SD: 2.44)
ADHD Symptom Prevalence (%)	**Female Participants (n=140)**	**Male Participants (n=60)**	

- Part A (Score ≥ 4)	45.7%	41.7%	47.0%
- Part B (Score ≥ 6)	50.0%	33.3%	45.5%

Figure 1.

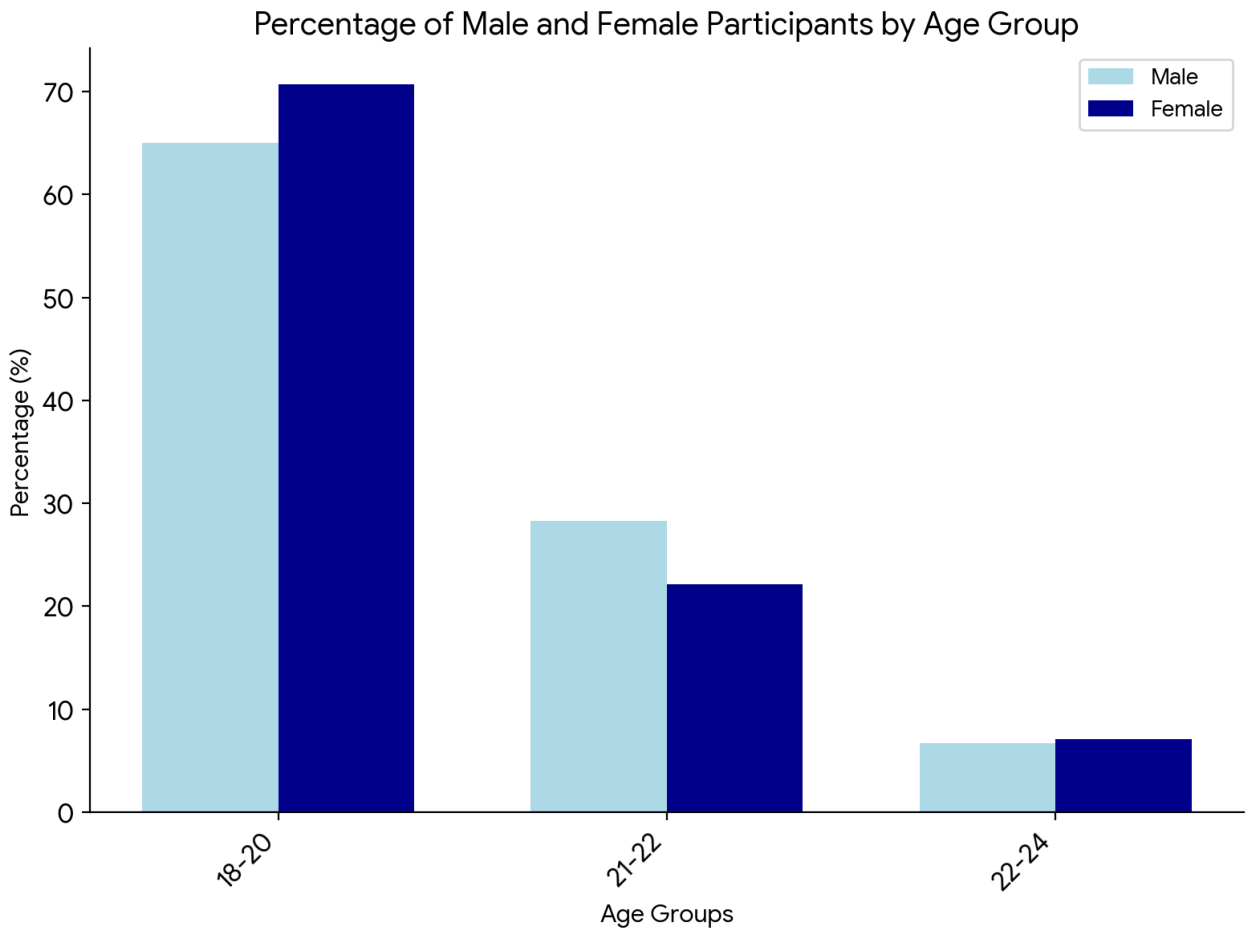

Percentage of Male and Female Participants by Age Group
Male
Female
Percentage (%)
0
10
20
30
40
50
60
70
18-20
21-22
22-24
Age Groups

Figure 2.

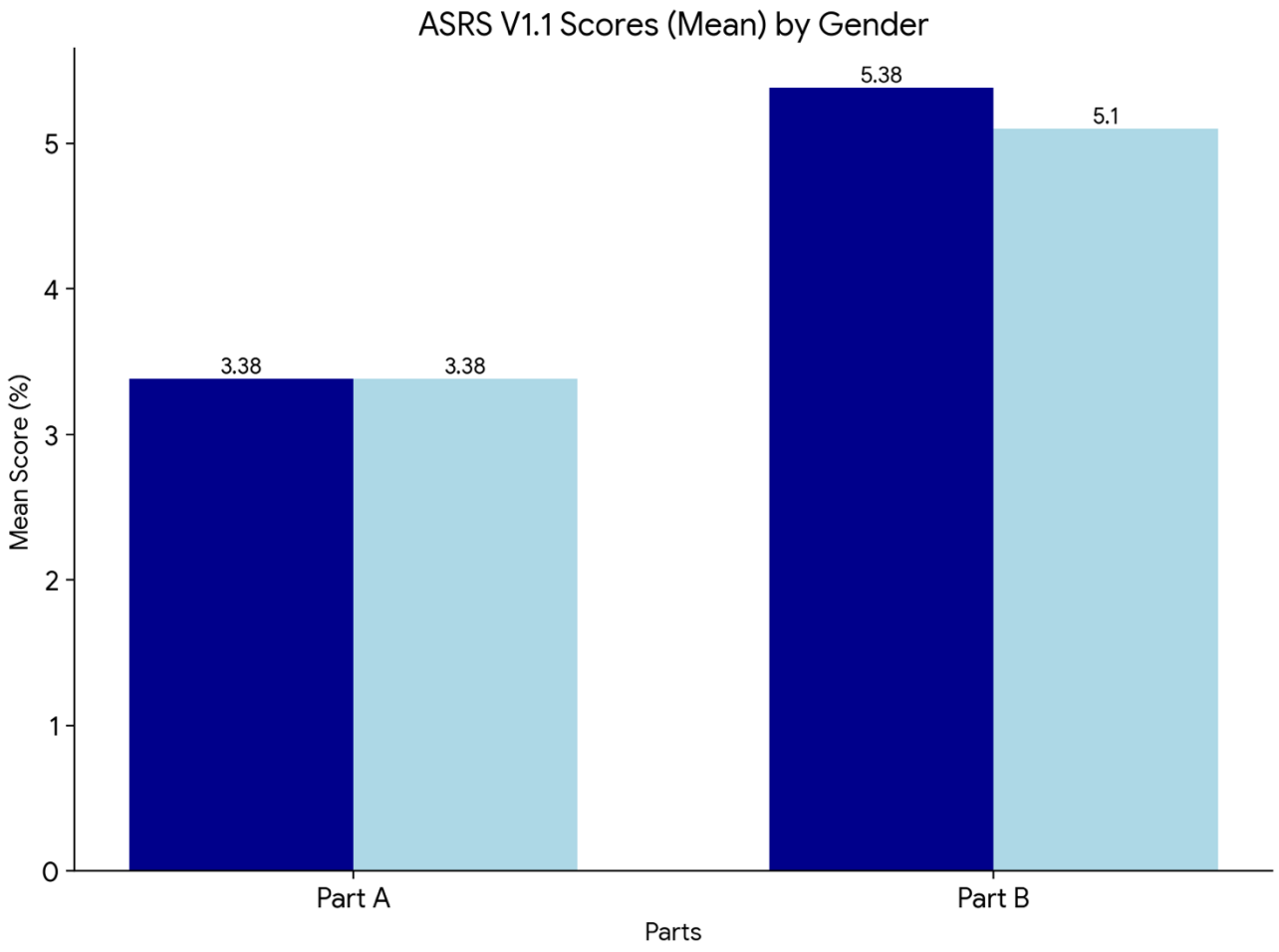
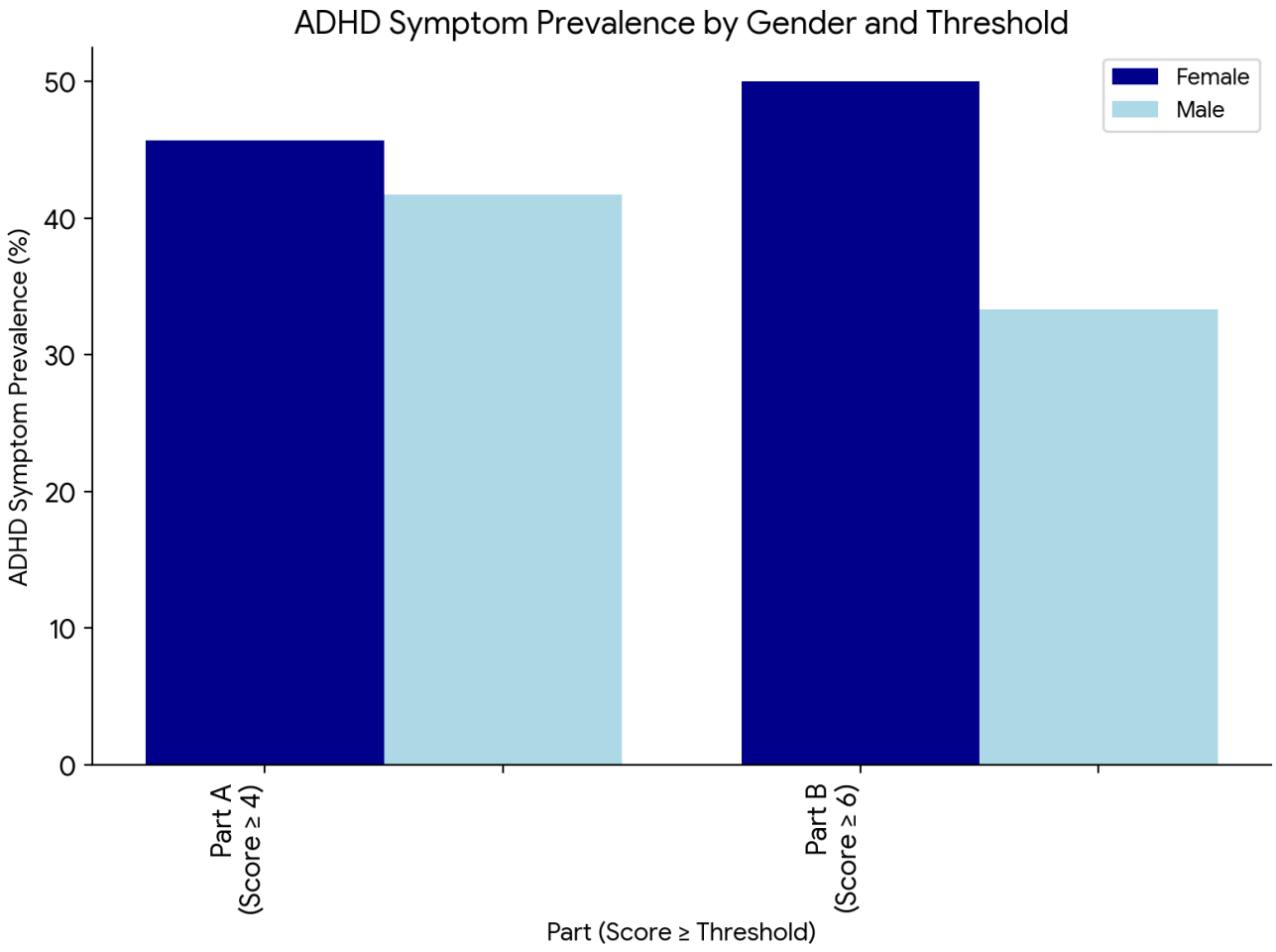

ASRS V1.1 Scores (Mean) by Gender
Mean Score (%)
0
1
2
3
4
5
3.38
3.38
5.38
5.1
Part A
Part B
Parts

Figure 3.


ADHD Symptom Prevalence by Gender and Threshold
Female
Male
ADHD Symptom Prevalence (%)
0
10
20
30
40
50
Part A (Score ≥ 4)
Part B (Score ≥ 6)
Part (Score ≥ Threshold)