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Research Article

Depression and Tension Type Headache: Untangling the Cause and Effects Relationship through HSQ-EV and PHQ-9 in Medical students: A Pan India Study

Rajat Mehta[1], Varun Pareek[1], Susheel Kumar[1], Lokendra Sharma[1,*], Rajveer Singh Rathore[1]

[1] *Department of Pharmacology, RUHS College of Medical Sciences, Jaipur*

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* *Corresponding author.*
Lokendra Sharma
vpmd3487@outlook.com

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ABSTRACT

Depression is a widespread mental disorder, affecting approximately 280 million people globally. It's characterized by persistent low mood and loss of interest in daily activities. Depression disproportionately affects women and is linked to a heightened risk of suicide, making it a significant public health concern. In 2019, it ranked as the largest contributor to mental health-related disability. Another prevalent issue is tension-type headache (TTH), a neurological condition causing a band-like discomfort around the forehead. Headache disorders, including TTH and migraines, were the 14th leading cause of disability worldwide in 2019. Migraines, characterized by severe pain and neurological symptoms, are particularly impactful and prevalent among women and high socio-demographic groups. Recent research has explored the relationship between depression and headaches, revealing a bidirectional association. People with chronic TTH often exhibit higher rates of anxiety and depression. Moreover, individuals with depression have an increased risk of developing migraines or TTH. A Pan-India cross-sectional observational study was conducted across many medical colleges in India between September 11, 2023 and September 28, 2023. A self-administered questionnaire was used to collect data using web-based linkages. Based on these findings, it was established there is positive association between Depression and TTH ($p=0.003898$, $X^2=11.09$). We found a bidirectional relationship between Depression and TTH. We also found that depressed mood also increases the frequency and intensity of TTH.

Keywords: Depression; Tension - Type Headache; Medical Students; Headache

INTRODUCTION

A common mental disorder is depressive disorder (also known as depression). It is characterised by a depressed mood or a loss of pleasure or interest in activities over an extended period. Depression is distinct from normal mood swings and feelings about daily life.

According to WHO (accessed 29th sept 2023), Depression affects an estimated 3.8% of the population, including 5% of adults (4% of males and 6% of women) and 5.7% of individuals over the age of 60. Depression affects around 280 million people worldwide. Women are around 50% more likely than men to suffer from depression. More than 10% of pregnant women and new mothers worldwide suffer from depression. Every year, around 700,000 people commit suicide. Suicide is the fourth highest cause of death among those aged 15 to 29.

In 2019, depression was the biggest cause of mental health-related disease burden and a major cause of disability in the globe, impacting roughly 280 million people and accounting for more than 47 million disability adjusted life-years[1]. Depression is expected to become a primary illness burden by 2030, according to the World Health Organization. Depression is also linked to an increased risk of death from other illnesses and suicide[2]. According to GBD 2019, depressive disorders ranked 6th cause of disability-adjusted life-years (DALYs), in adolescents aged 10–24 years[1].

Headache is the most common neurological symptom, which almost everyone experiences at least once in their lives[3]. The most common type of headache, primary

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headaches, entail a large economic cost[4]. Headache disorders were the 14th leading cause of Disability Adjusted Life Years (DALYs) in the world in 2019, affecting both men and women of all ages[1]. Healthcare personnel are exposed to a variety of trigger variables that contribute to an increase in headache frequency, the most significant of which are sleep disruptions, stress, and irregular eating habits[5]. Migraines and tension-type headaches (TTH) are the most common types of primary headaches.

TTH is a common neurological condition. Tension-type headache (TTH) is a type of headache characterised by discomfort that is usually described as "a band around the forehead" and it also does not cause nausea or vomiting[6]. It contains at least two of the following characteristics: it is mild to moderate in severity, it occurs on both sides of the head (bilaterally), it is not made worse by ordinary activity (bending over or climbing stairs), and the pain is pressing or tightening rather than throbbing or pulsing[7]. A tension-type headache may be accompanied by photo- and phonophobia, but not by both symptoms at the same time[8]. Migraine and TTH are significant concerns in global health since the severity of their impact varies greatly between nations and is disproportionately higher among women, those aged 30-39, and groups with a high Socio Demographic Index (SDI)[4].

The relationship between depression and tension-type headache has been a subject of increasing interest in recent years. Several studies have suggested a bidirectional association between these two conditions.

According to the 2019 global burden of diseases research, depression ranked second in years lived with disability and headache disorders ranked third across all age groups and genders[1,9]. According to a meta-analysis of clinical research and demographic surveys conducted between 2000 and 2020, the top headache comorbidities included depression, hypertension, anxiety, diabetes, and sleep problems[10]. On a cognitive level, studies indicated that individuals with chronic TTH had significantly greater rates of state anxiety and trait anxiety, as well as significantly higher rates of depression, when compared to healthy controls[11]. In a recent study, we discovered a 30% increased risk of depression among migraine or TTH patients, and that depression at baseline more than doubled the risk of migraine, while a 40% increased risk of TTH was discovered[12]. A recent population-based study in Korea found that patients with TTH were nearly twice as likely as those without to develop depression (4.2% vs. 1.8%)[12,13]. Comorbid depression or anxiety may result in headaches that are more intense, last longer, and occur more frequently[14–16].

This study seeks to address the following research objectives: First, to assess the prevalence of tension-type headache among MBBS student in medical colleges of India using the Headache Screening Questionnaire-Dutch Version (HSQ-DV)[17]. Second, to evaluate the presence and severity of depressive symptoms in the same population using the Patient Health Questionnaire-9 (PHQ-9)[18]. Third, to explore the relationship between tension-type headache and depression, including the directionality of this association. Fourth, to evaluate the association between onset of depression and headache episodes. Fifth, to assess intensity and frequency of headache with depression.

Understanding the relationship between depression and tension-type headache is of paramount importance for several reasons. Firstly, it can inform healthcare providers and policymakers about the need for integrated approaches to address mental health and headache disorders. Secondly, identifying modifiable risk factors and potential mediators may guide the development of targeted interventions to reduce the burden of both conditions. Lastly, studying this relationship within the unique context of a medical college in India can provide insights into the specific challenges and opportunities for healthcare delivery and student well-being in this setting.

MATERIALS AND METHODS

- **Study Design:** In Indian medical colleges, a cross-sectional observational study of MBBS students was carried out. Each participant submitted an online consent. Google forms questionnaires were used to acquire the data. Initially, Google Scholar and PubMed were used for research.
- **Inclusion criteria:** Each participant must be at least 17 years old. Each participant must be enrolled in an MBBS program at an accredited medical college in India.
- **Method of sampling:** Sample Size was calculated based on the following formula (for infinite population) using sample size formula as mentioned below.

$$S = Z2 \times P \times (1 - P)/M2$$

Where, S=sample size for infinite population, Z=Z score, P=population proportion (assumed as 50% or 0.5), M=margin of error, given: Z=1.960, P=0.5, M=0.05 (Have taken confidence level as 95% and margin of error as 5%). Thus, the sample size was calculated to be 384.16.

- **Study Tool:** The research tool employed was a questionnaire. Consent, demographic data, a link between headache and depression, a headache screening test (HSQ-DV), and a depression screening test (PHQ-9) were all included in the questionnaire that was sent out. This study was carried out with ethical approval and participants' consent (Table 1). The questionnaire was pre-tested on a small number of people to ensure its validity, correctness, and precision (Table 2). Consent was gathered using a Google form as well as a supplementary consent form that explained the study's goal and methodology.

- **Statistical Evaluation**: The obtained data was analysed through Microsoft Excel tool Pak extension.

RESULTS

The study was conducted in MBBS students from September 11th to September 28th, 2023. A total of 458 students provided responses, 444 of which are research-worthy. As a result, our final study sample consists of 444 MBBS undergrad students. They all provided written consent and agreed to participate in the study. Out of 444 students, 252 (57%) are male and 192 (43%) are female (See Figure 1)

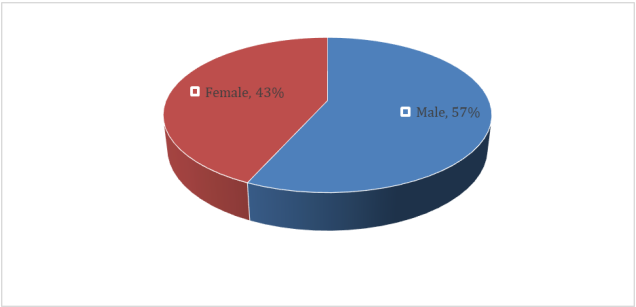

Fig. 1: Male and Female distribution

The number of students from Jaipur is 318 (72%), Jodhpur is 56 (13%), Rohtak is 21 (5%), Rishikesh is 15 (3%), Sonipat is 14 (3%), Bhopal is 11 (3%), Kolkata is 4 (1%), and the rest of the students are from Udaipur, Bikaner, Mirzapur, Kota, Shimla, etc. (See Figure 2)

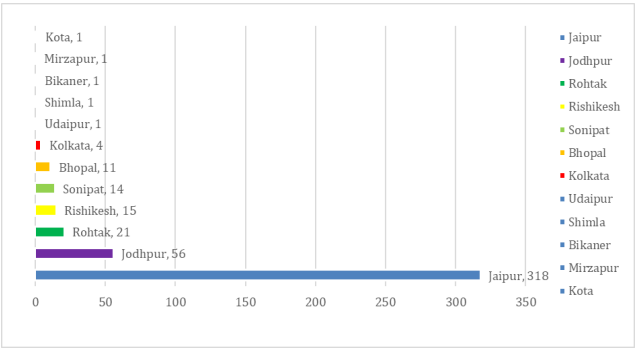

Fig. 2: City wise distribution

The number of students from the first year is 330 (74%), the number of students from the second year is 94 (21%), the number of students from the third year is 9 (2%), the number of students from the fourth year is 6 (2%), and the number of students from internship is 5 (1%) (See Figure 3)

HYPOTHESIS: Null Hypothesis(H0) - There is no association between TTH and Depression status if P-Value>0.05

Alternate Hypothesis(H1) - There is an association between TTH and Depression status if P-Value<0.05.

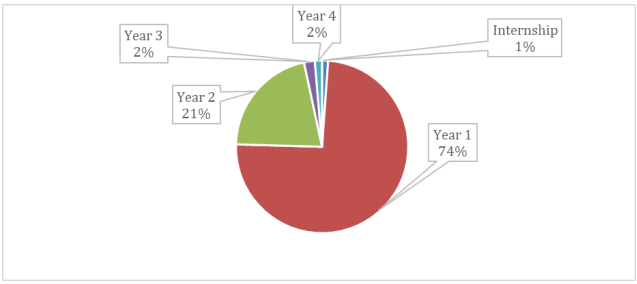

Fig. 3: Year of Study

Out of 444 students, 244 (54.95%) agreed that they experience anxiety, stress, or depression on a daily basis, with 79 (32.37%) saying they have experienced the same in the last 3-4 weeks, 26 (10.66%) in the last three months, 14 (5.74%) in the last six months, 38 (15.57%) in the last year, 49 (20.08%) in the last one to three years, and 30 (12.30%) being more than three years.

Out of 444 students, 213 (47.97%) stated that they have experienced headaches. Among these 213 students, 57 (26.76%) have had the same experience in the past 3 to 4 weeks, 21 (9.86%) in the last 3 months, 12 (5.63%) in the last 6 months, 34 (15.96%) in the last year, 41 (19.25%) in the last 1 to 3 years, and 42 (19.72% in the last more than 3 years).

We also included a depression severity assessment tool, the Patient Health Questionnaire-9 (PHQ-9), and found that out of 444 students, 175 (39.41%) have minimal or no depression, 156 (35.14%) have mild depression, 77 (17.34%) have moderate depression, 23 (5.18%) have moderately severe depression, and 13 (2.93%) have severe depression, so 175 students (39.41%) do not have any kind of depression and 269 (60.59%) do (See Figure 4)

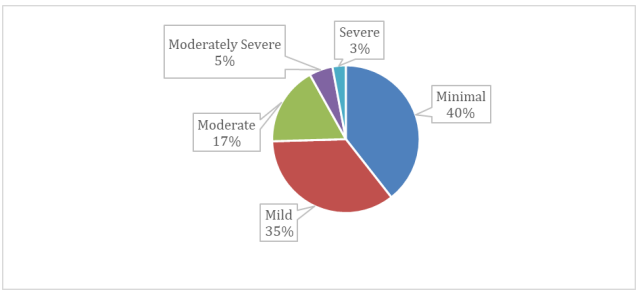

Fig. 4: Depression severity according to PHQ-9

We also used the HSQ-DV to assess tension type headache according to the scoring criteria used for tension type headache and discovered that out of 444 students, 273 (61.49%) are diagnosed with NO TTH, 139 (31.31%) are diagnosed with Probable TTH, and only 32 (7.21%) are diagnosed with TTH (See Figure 5)

We also looked at the association between TTH and depression and found that only 24 students, or 5.41%, had TTH and depression, while 8 students, or 1.80%, have TTH

Table 1: Consent Statement

Consent statement	Response
All information provided by you (survey participants) will be kept strictly confidential, and submitted data will not be shared with anyone. The information provided will be published in the form of a research study, poster presentations, academic articles, and so on. Please confirm that you understand, appreciate, and can reason through all the information provided to you regarding the questionnaires and the objectives of this study, and that you consent to the use of the above information for the purpose of the study	Yes/no

Table 2: Questionnaire

Question number	Questions
1	Name
2	Age
3	Gender
4	Name of your college (write full name)
5	In which city your college is located?
6	Specify in which year of MBBS curriculum, are you right now
7	Do you experience Anxiety, Stress or Depression in day-to-day life?
8	If yes, how long you have been facing the problem of Anxiety/Stress/Depression
9	Have you been facing problem of headache
10	If yes, how long you have been facing headache problem
11	Do you feel that your headache frequency changes during the periods of depressed mood or anxiety
12	If yes, specify how the frequency of headache changes
13	Does your intensity of headache changes during periods of depressed mood or anxiety
14	If yes, then specify how intensity changes
15	Please select the applicable option that describes your pattern of headache and depression/ or anxiety
16	Headache Screening Questionnaire-Dutch Version for assessment of Tension-Type Headache
17	Patient Health Questionnaire-9 (PHQ-9) for assessment of severity of Depression

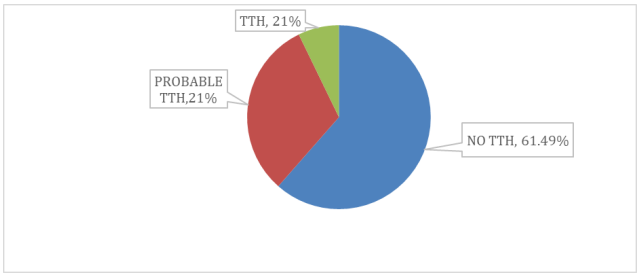

Fig. 5: TTH assessment according to HSQ-DV

but no depression. 96 students, or 21.62%, have Probable TTH with depression, while 43 students, or 9.68%, have Probable TTH but no depression. 149 students, or 33.56%, have NO TTH and depression, while 273 students, or 61.49%, have NO TTH and no depression (Table 3Figure 6). We found that there are 124 students, or 27.93%, with minimal depression and NO TTH, 88 students, or 19.82%, with mild depression and NO TTH, 39 students, or 8.78%, with moderate depression and NO TTH, 14 students, or 3.15%, with moderately severe depression and NO TTH, and 8 students, or 1.80%, with severe depression and NO TTH. We also found that 43 students, or 9.68%, have minimum depression and Probable TTH, 59 students, or 13.29%, have mild depression and Probable TTH, 27 students, or 36.08%, have moderate depression and Probable TTH, 5 students, or 1.13%, have moderately severe depression and Probable TTH, and the same for severe depression and Probable TTH. We also discovered that 8 students, or 1.80%, have minimal depression with TTH, 9 students, or 2.03%, have mild depression with TTH, 11 students, or 2.48%, have moderate depression and TTH, 4 students, or 0.90%, have moderately severe depression and TTH, and there are no students who have severe depression and TTH together.

Table 3: TTH and Depression

	TTH	Probable TTH	No TTH	Grand Total
Depression	5.41%	21.62%	33.56%	60.59%
No Depression	1.80%	9.68%	27.93%	39.41%
Grand Total	**7.21%**	**31.31%**	**61.49%**	**100.00%**

Out of 444 students, 222, or 50%, reported that headache frequency changes during instances of depression or anxiety. 172 of the 222 students, or 77.48%, believed that headache frequency increases during instances of depression or

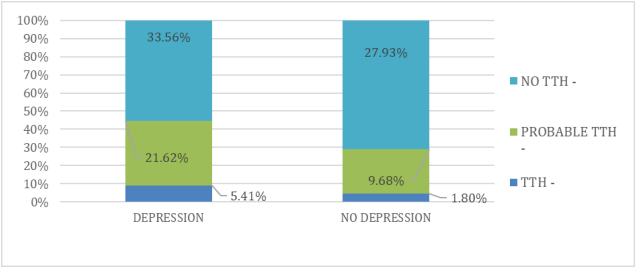

Fig. 6: TTH and Depression

anxiety (Figure 7)

Out of 444 students, 233 (52.48%), reported that the intensity of headaches changes during instances of depression or anxiety. Out of these 233 students, 191 (81.97%) believed that the intensity of headaches increases during instances of depression or anxiety (See Figure 8)

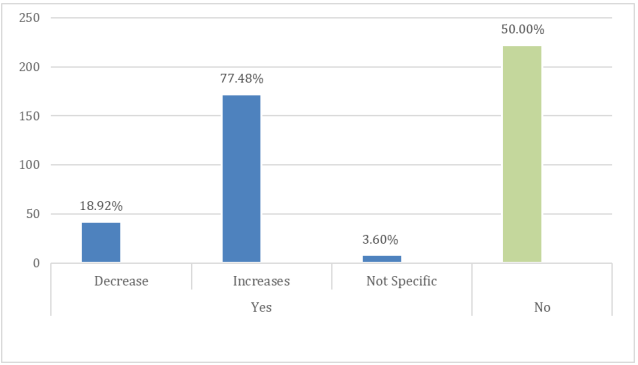

Fig. 7: Do you feel that your headache frequency changes during the periods of depressedmood or anxiety

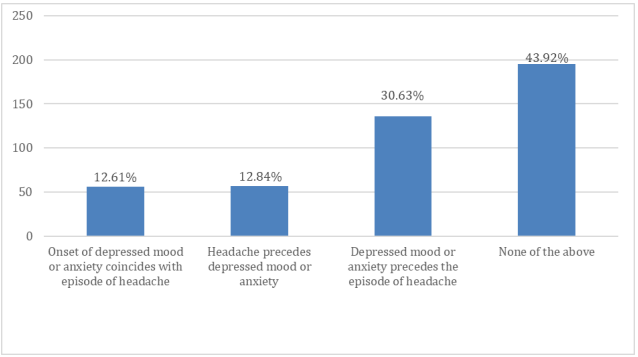

Fig. 8: Please select the applicable option that describes your pattern of headache and depression/ or anxiety

We asked 444 students about the causal connection between headache and depression or anxiety and came across that 56 (12.61% of students) believed that the onset of depressed mood or anxiety coincides with episodes of headache, 57 (12.84% of students) believed that headache precedes depressed mood or anxiety, 136 (30.63% of students) believed that depressed mood or anxiety precedes the episode of headache, and 195 (43.92% of students) believed that there is no such association between headache and depression (See Figure 8)

The chi square test value for TTH and Depression is 11.09, degree of freedom is 2 and p value is 0.003898. As the p value obtained is less than 0.05 thereby establishing that there is association between TTH and depression (Tables 4 and 5) The p value of 0.003898 indicates that under the null hypothesis, these data would have an 0.3898% chance of occurring. Since these data have a very low probability of occurring under the null hypothesis, the null hypothesis is likely to be rejected. This is also seen in other studies.

Table 4: Ob served and Expected Values

Observed [Expected] Values				
Row Labels	**TTH**	**PROBABLE TTH**	**NO TTH**	**Grand Total**
Depression	24[19.39]	96[84.21]	149	269
No Depression	8[12.61]	43[54.79]	124	175
Grand Total	**32**	**139**	**273**	**444**

Table 5: Chi square, Degree of freedom and P-value

ChiSquare [X2] **And Degreeof Freedom [Df]**		
X2	**11.09438011**	**Sum Of (O-E)2/ E**
Df	2	(R-1) *(C-1)
P-Value	0.003898396	CHISQ.DIST. RT (X2, DF)

DISCUSSION

In the present study, we used the HSQ-DV [ICHD-3 beta criteria] and PHQ-9, respectively, to examine the prevalence of TTH and depression among Indian MBBS students. Using this questionnaire, the respondents could be categorized into the following domains: minimal depression, mild depression, moderate depression, moderately severe depression, and severe depression; TTH, probable TTH, and no TTH. We also evaluate the relationship between TTH and depression, including how depression affects a patient's headache frequency and intensity. This is the first study of its kind conducted in India among MBBS medical students.

The current study indicated that the prevalence of depression was 60.6% and the prevalence of TTH was 38.5%. Additionally, among similar studies conducted around the world, the incidence of TTH among medical students in the Kathmandu Valley of Nepal[19] was discovered to be 40.3%, while results from Saudi Arabia revealed a similar prevalence (43.9%)[20]. Significantly lower prevalence was reported in studies from Syria[21], Turkey[22], and Nigeria[23]. The current study's reported prevalence of TTH (40.3%) is in line with previous population-based study findings, which

ranged from 12 to 78%[24]. Depending on the population that is chosen, the prevalence of TTH can vary even within the same area. For instance, TTH prevalence among female students at Saudi Arabia's Taif University was estimated to be 29.5%[6], while a prior study on female students from several institutions in Saudi Arabia revealed a higher prevalence of TTH, with 41.6% of students having the condition[25]. Another study conducted in Saudi Arabia at Taibah University likewise revealed a greater incidence (58%) which may have been explained by the study's focus on medical students[26]. These disparities in TTH prevalence between nations could be explained by variations in ethnicity, socioeconomic status, and cultural background.

Compared to the general population, the medical population had a noticeably greater rate of depression. 60.6% of participants in the current study reported having depression, which is greater than the overall population. 38.7% of female university students in a Saudi Arabian survey reported having depression6. According to a 2015 comprehensive analysis, the estimated prevalence of depression among resident physicians ranged from 20.9 to 43.2%, depending on the assessment instruments employed[27]. Both during and after the hour-long laboratory stress task, depression increased the risk of TTHs i.e.,100% of the participants in the headache-prone/depressed group reported having a headache at some point during the task. This rate was approximately twice that of the headache-prone/non-depressed participants and ten times higher than that of the healthy controls[28]. Disparities in depression prevalence rates could be attributed to a variety of study designs and assessment tools.

According to the results of the current study, only 1.80% of students who are not depressed had TTH, compared to 5.41% of depressed students. Comparable outcomes are also observed in TTH students who either have depression or do not have depression. According to a recent population-based study conducted in Korea, individuals with TTH had a nearly two-fold higher likelihood of depression (4.2% vs. 1.8%) than patients without TTH[13]. A previous study shows 30% increased risk of depression among migraine or TTH patients, and that depression at baseline more than doubled the risk of migraine, while a 40% increased risk of TTH was discovered[12]. Additionally, a recent study discovered a bidirectional link between TTH and depression[12]. On the other hand, no correlation was discovered between depression and TTH in a Nepalese population-based study[29] and analyses using the combined data of six earlier cross-sectional EU investigations[30]. The diverse range of prevalence observed worldwide could be ascribed to various factors such as geographic location and elevation, cultural distinctions, data acquired during varying timeframes, and disparate measurement instruments.

CONCLUSION

We discovered a link between tension headache and depression. We also discovered that headache frequency and intensity increase during periods of depression or worry. 30.63% of students reported that a period of despair or anxiety preceded an incidence of headache, whereas 43.92% reported that there is no such link between headache and depression.

TTH is identified in 5.41% of students who also have depression, while 1.80% had TTH but no depression. This clearly shows that the prevalence of TTH combined with depression is higher than the prevalence of TTH alone. A similar pattern may be seen with Probable TTH, where the prevalence of Probable TTH with depression is higher than the prevalence of TTH without depression.

Limitations of Study

Due to the younger age spectrum of the study participants (17-26) and the fact that the sample only included undergraduate medical students, the results cannot be generalised to the general population, necessitating a larger multicentric inquiry for a generalisable association or lack thereof.

Acknowledgement

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Ethical Consideration

Ethical approval was taken.

Data Availability Statement

Since data contains participants identifying information, the data can only be shared upon reasonable request.

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