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A STUDY TO ASSESS THE LEVEL OF KNOWLEDGE AND PREVENTIVE MEASURES FOR PULMONARY TUBERCULOSIS AMONG THE CAREGIVERS OF PATIENTS ADMITTED IN TUBERCULOSIS WARD OF SELECTED HOSPITALS, BHUBANESWAR, ODISHA

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Abstract: Tuberculosis, caused by Mycobacterium tuberculosis, remains a major global health challenge, primarily affecting the lungs but capable of spreading to other organs. Its persistence is driven by poverty, overcrowding, and compromised immunity. Despite its ancient history, TB continues to burden healthcare systems due to complex biological, environmental, and social factors, making its prevention, diagnosis, and treatment a significant public health concern. This study aimed to assess the level of knowledge and preventive measures among caregivers of patients admitted in tuberculosis ward of selected hospitals Bhubaneshwar.

METHOD: A quantitative, descriptive study was conducted using a non-probability convenient sampling technique a sample of 70 caregivers from IMS and SUM Hospital and SUM Ultimate Medicare, Bhubaneswar. Data were collected face-to-face using pen-and-paper questionnaires. The Tuberculosis Knowledge Assessment Questionnaire (TBAQ) and a self-structured tool assessed knowledge and preventive measures. SPSS v20 was used for data analysis.

RESULTS: The study found that 55.7% of caregivers had average knowledge of tuberculosis, 40% had good knowledge, and 4.3% had poor knowledge. Regarding preventive measures, 71.5% showed average practices, 17.1% good, and 11.4% poor.

CONCLUSION: The study tried to assess the level of knowledge and preventive measures about tuberculosis among caregivers of tuberculosis patients. There was a significant association between the knowledge and monthly income and there was non-significant association with other sociodemographic variables i.e. age, gender, marital status, religion, education, occupation, residence, anybody else in your family affected with tuberculosis, and relation with patient. There was non-significant association between preventive measures and selected sociodemographic variables.

Key Words: TB, Knowledge, Preventive measures, M-DR, X-DR. PTB.

INTRODUCTION

Tuberculosis is a potentially serious infectious bacterial disease that mainly affects the lungs. The bacteria that cause TB are spread when an infected person coughs or sneezes. Tuberculosis (TB) is largely

preventable and cured. Nevertheless, tuberculosis (TB) remained the second most common infectious agent-related fatality worldwide in 2022, trailing only coronavirus disease (COVID-19), and caused nearly twice as many deaths as many fatalities due to HIV/AIDS.[1] Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, spreads through airborne droplets from infected individuals. Though primarily affecting the lungs (pulmonary TB), it can also impact other organs. Identified by Robert Koch in 1882, TB has afflicted humans for millennia. About 90% of cases occur in adults, with a higher prevalence in men.[2] Historically known as the "white plague," tuberculosis was termed *phthisis* by Laennec in 1804 and later named "tuberculosis" by Schönlein in 1839. The infectious nature of TB was confirmed in 1882 when Robert Koch identified the tubercle bacillus as its cause.[3] *Mycobacterium tuberculosis* is an aerobic, nonmotile, acid-fast bacillus that produces catalase and grows slowly on specialized media, forming rough, cream-colored colonies in about two weeks. Its cell wall contains toxic glycolipids and antigenic components, including lipids, polysaccharide-protein complexes, and wax D.[4] Pulmonary tuberculosis spreads via inhalation of droplet nuclei (1–5 μm) containing *M. tuberculosis*. These reach the alveoli, triggering inflammatory and immune responses. Initial infection is often mild and localized. Disease progression depends on factors like bacterial load, virulence, host immunity, and underlying conditions such as HIV, diabetes, cancer, or immunosuppression.[5] Non-tuberculous mycobacteria (NTM) include around 170 species, with *M. avium* complex, *M. kansasii*, and *M. abscessus* most commonly causing lung disease. NTM infections are typically acquired from the environment and can also affect the skin, soft tissues, and lymph nodes. Risk factors include HIV, cancer, diabetes, alcoholism, COPD, bronchiectasis, and prior TB.[6] TB diagnostic methods have improved significantly, with WHO now recommending rapid molecular tests as the primary diagnostic tool, many of which also detect drug resistance. A urine-based lateral-flow test is advised for TB diagnosis in advanced HIV cases. Sequencing technologies further support drug resistance profiling. Despite advances, sputum smear microscopy remains common in low- and middle-income countries but is gradually being replaced by faster methods.[7] Culture remains the gold standard for TB diagnosis and is essential for confirming low-probability cases and detecting resistance to newer drugs. It is also used to monitor treatment response. Without treatment, TB has a high fatality rate—historical studies show a 10-year mortality of ~70% for smear-positive and 20% for smear-negative, culture-positive pulmonary TB.[8] Effective TB treatment began in the 1940s. WHO now recommends a 6-month regimen of isoniazid, rifampicin, pyrazinamide, and ethambutol for drug-susceptible TB. A 4-month regimen with rifapentine, isoniazid, pyrazinamide, and moxifloxacin is advised for patients aged 12 and older. Children aged 3 months to 16 years with non-severe, drug-susceptible TB may also receive a shortened 4-month treatment.[9] WHO data from 194 Member States show a treatment success rate of over 85% for the standard 6-month TB regimen. For multidrug-resistant TB (MDR-TB) and rifampicin-resistant TB (RR-TB), WHO recommends a 6-month BPaLM regimen (Bedaquiline, Pretomanid, Linezolid, Moxifloxacin). For pre-XDR-TB, the BPaL regimen (excluding Moxifloxacin) is used. This is recommended for patients aged 14 and above, with longer regimens available for others.[10] The Bacille Calmette-Guérin (BCG) vaccine, developed nearly a century ago, is the only approved TB vaccine and primarily protects children from severe forms of the disease. While no licensed vaccine exists to prevent adult TB, the M72/AS01E candidate has shown promising results in Phase II trials.[11] Tuberculosis management requires a multimodal approach, with Directly Observed Treatment, Short-Course (DOTS) as a key strategy. Introduced by WHO in 1994, DOTS addresses treatment adherence and drug resistance, offering a scalable and effective framework for global TB control.[12] DOTS emphasizes the direct observation of TB treatment by a healthcare worker or trained community member. This ensures that patients complete their prescribed regimen and adhere to the treatment plan. The treatment regimen under DOTS is relatively short, typically lasting six to nine months for drug-sensitive tuberculosis. This short-course approach enhances treatment adherence and reduces the risk of drug resistance. Directly Observed Treatment, Short-Course promotes the use of standardized treatment regimens based on the category of tuberculosis, ensuring consistency and effectiveness in patient care. DOTS (Directly Observed Treatment, Short-course) is the most effective

strategy available for managing the TB epidemic today. Through the use of both managerial and technical elements, DOTS rapidly ends the cycle of transmission and renders infectious cases non-infectious. Moreover, the use of DOTS stops the emergence of drug-resistant TB strains, which are frequently lethal and require treatment that is nearly a hundred times more costly.Both large and small, wealthy and impoverished nations have found success with this tactic. Benin, Guinea, Peru, Nicaragua, China, and Vietnam are among the nations attaining high rates of cure and coverage. About half of China's population is currently covered by the DOTS strategy, which saw cure rates increase from less than 50% to over 95% in areas covered. Peru government's commitment to the strategy has led to nearly complete DOTS coverage and up to 83 percent cure rates in the nation.[13]

In 2022, 7.5 million new cases of tuberculosis were reported worldwide. This figure, which is higher than the pre-COVID baseline (and prior historical peak) of 7.1 million in 2019, is the highest since WHO started tracking tuberculosis globally in 1995. It was 5.8 million in 2020 and 6.4 million in 2021. The amount in 2022 most likely includes a sizable backlog of patients who had tuberculosis in prior years but whose diagnosis and treatment were postponed due to COVID-related interruptions that impeded access to and delivery of medical care.[14]

According to the Global TB Report 2022, india's expected incidence of MDR/RR-TB in 2021 was 119,000 (93,000-145,000). During the pandemic, a considerable reduction was found in the overall number of DR-TB patients detected as compared to 2019 under the programme. The number of MDR/RR-TB cases identified using (National Tuberculosis Elimination Programme) NTEP increased by 32% in 2022 compared to 2021.[15]

In India, the mortality rate due to all kind of tuberculosis increased by 11% between 2019 and 2021. the total number of estimated TB related deaths, for the year 2020 was 4.93 lakh, which is 13% higher then, the estimates 2019. about 61% of patients suffering from TB were male and female continued 39% who were put on treatment. 6% 0f the notified patients were in the pediatric category. Twenty-one million people in India were screened in 2022 as part of active case-finding initiatives for probable tuberculosis symptoms and signs. A total of 19.5 lakh people were screened, and 48,329 people (2.5%) out of them had a TB diagnosis after being checked and tested.[16]

Material and method:

This study employs a quantitative approach, a non-experimental descriptive survey research design is used in this study to offer an extensive understanding of knowledge and preventive measures among caregivers of tuberculosis patients. The study was conducted at the IMS and Sum Hospital and SUM ULTIMATE MEDICARE. The Research Variables are Knowledge and preventive measures for Tuberculosis among the care givers. The Socio-Demographic Variables are Age, Gender, Marital status, Religion, Education, Occupation, Residence, anybody else in your family affected with tuberculosis, and Relation with patient.

Sample size:

The population of this study consists of caregivers of TB patients at the IMS and Sum Hospital and SUM ULTIMATE MEDICARE. The sample includes a total of 70 caregivers from the IMS and Sum Hospital and SUM ULTIMATE MEDICARE. The participants were selected using Convenient sampling. The sample size is calculated by Solvin's formula as: $\mathbf{n = N / (1 + Ne^2)}$

Where: n = sample size,

N=Population size (85)

e=margin of error (0.05)

Tools for data collection:

This study's data collection tools are purposefully constructed to collect essential data related to socio-demographic variables, knowledge and preventive measures among caregivers of TB patients.

The tool-1: Socio-demographic questionnaire, designed to collect information onvarious sociodemographic variables. Caregivers of TB patients will provide responses to questions related to their Age, Gender, Marital status, Religion, Education, Occupation, Residence, anybody else in your family affected with tuberculosis, and Relation with patient.

Tuberculosis Knowledge Assessment Questionnaire (TBAQ), this tool focuses on Tuberculosis. The purpose of this knowledge questionnaire is to evaluate the depth of knowledge caregivers possess about Tuberculosis, covering aspects such as causes, risk factors, symptoms, treatment of TB, which include 18 items. This tool's scores are categorized into three levels: Good knowledge (13-18), Average knowledge (7-12), and Poor knowledge (1-6).

The tool-3: Structured prevention questionnaire, which explores caregivers' preventive measures towards tuberculosis patients, it includes 12 items. This tool's scores are categorized into three levels: Good prevention (9-12), Average prevention (5-8) and Poor prevention (1-4).

All three tools employ the conventional pen-and-paper method of data collection, ensuring an organized and uniform approach to obtaining participant information. For content validity, the tools were reviewed by experts in survey methodology, nursing education, and pulmonology. Their suggestions were taken into consideration to make the questions more thorough and understandable. A pilot study was conducted with a small group of caregivers who were not part of the main study sample. Further modifications were made possible by the identification of any ambiguities or issues with the questionnaire items through this pilot test. The final versions of the socio-demographic questionnaire, Tuberculosis Knowledge Assessment Questionnaire (TBAQ), and structured prevention questionnaire were then confirmed for use in the main study.

Data collection procedure:

The process of data collection was thoroughly planned out and carried out to ensure the study's reliability and integrity. First, formal permission was obtained from the medical and nursing superintendent of IMS and Sum Hospital and SUM ULTIMATE MEDICARE, and ethical approval from the relevant ethics committee was obtained. informed consent was taken from all participants ensuring they were fully aware of the study's purpose, procedures, and their rights. Meetings with potential participants in person were used for participant identification and sampling. A total convenient sampling method was used to select 70 caregivers of TB patients. For data collection, the socio-demographic questionnaire, the Tuberculosis Knowledge Assessment Questionnaire (TBAQ), and the structured prevention questionnaire were administered using a conventional pen-and-paper method. Researchers were on hand to answer any questions or concerns during the process, and participants received clear instructions to make sure they understood how to fill out the questionnaires. This comprehensive strategy assured a uniform and systematic data collection process.

Plan for data analysis:

The plan for data analysis is intended thoroughly to assess the knowledge and preventive measures of caregivers of tuberculosis patients. Initially, data from the questionnaires will be coded and entered into a statistical software program for analysis (IBM statistical software, specifically SPSS version 20.0), followed by data cleansing to identify and correct any missing values or discrepancies. Descriptive statistics will be utilized to summarize the socio-demographic characteristics of the participants, with frequency distributions, means calculated for knowledge and preventive measures. Inferential statistics will

further elucidate the findings; Chi-square tests will examine associations between socio-demographic variables.

Results: Frequency and percentage distribution of sample with their selected socio-demographic variable.

Table no.1: Socio-demographic profile of study participants

DEMOGRAPHIC VARIABLE	FREQUENCY (F)	PERCENTAGE (%)
Age		
A.17-25	11	15.7
B.26-35	24	34.3
C.36-45	22	31.4
D.>45	13	18.6
Gender		
A. Male	39	55.7
B. Female	31	44.3
C. Transgender		
Marital status		
A. Married	53	75.7
B. Unmarried	16	22.9
C. Widow	1	1.4
Religion		
A. Hindu	48	68.6
B. Muslim	14	20.0
C. Christian	8	11.4
Education		
A. No formal education B. Primary education (1-8)	9	12.9
C. Secondary education (9-12)	16	22.9
D. Collegiate	27	38.6
	18	25.7
Occupation		
A. Government employee	6	8.6
B. Farmer	13	18.6
C. Private employee	30	42.9
D. Housewife	21	30.0
Residence		
A. Urban	23	32.9
B. Rural	47	67.1
Monthly income		
A. <15000	31	44.3
B. 15000-20000	24	34.3
C. 25000-30000	8	11.4
D. >30000	7	10.0

Anybody else in your family affected with tuberculosis		
A. Yes	9	12.9
B. No	61	87.1
Relation with patient		
A. Father	14	20.0
B. Mother	8	11.4
C. Brother	16	22.9
D. Others (specify)	32	45.7

The frequency and percentage distribution of sociodemographic variables (Table no.1) among caregivers of TB patients in this study reveals several key patterns**.** The data shows distinct patterns in a variety of demographics. In terms of the age, the largest section falls within the 26-35 age group, comprising 34.3%, followed by the 36-45 age group at 31.4%. The smallest segment in terms of age is >45 age group consisting 18.6%, followed by 17-25 age group at 15.7% of the total sample. The gender distribution as males constituting a significant majority at 55.7%, while the remaining individuals are females at 44.3%. Division of marital status as 75.7% reporting married, 22.9% unmarried and 1.4% as widow. In terms of religion, the great majority of people identify as Hindu representing 68.6% of the total sample, with minority Muslims at 20.0% and Christians at 11.4%. Regarding education, most of the individuals have secondary level at 38.6%, with 25.7% college level, 22.9% primary level and 12.9% with no formal education. About occupation 42.9% individuals were private employee, 30.0% housewives, 18.6% farmers and 8.6% include government employees. In terms of residence 67.1% individuals were residing in rural areas and 32.9% from urban areas. Regarding monthly income 44.3% individuals fall 30000 INR. Notably, a large percentage of the group, 87.1% does not have anybody else in family affected with tuberculosis and only 12.9% individuals have other family members affected with tuberculosis as well. In terms of relations with patient 45.7% individuals were others (like husband etc.), 22.9% brothers, 20.0% fathers and 11.4% include mothers. These percentages provide insightful information about the makeup of the surveyed population, facilitating a more thorough comprehension of their demographic characteristics.

Table no.2: Frequency (f) and percentage (%) of level of knowledge among caregivers of tuberculosis patients.

LEVEL OF KNOWLEDGE	FREQUENCY(f)	PERCENTAGE (%)	MEAN
Good knowledge (13-18)	28	40	11.6
Average knowledge (7-12)	39	55.7	
Poor knowledge (1-6)	3	4.3	

The presented data in table- 2 shows that the mean value is 11.6 and according to that, out of all the individuals surveyed, 40% fall into the “Good’’ knowledge group, with scores ranging from 13 to 18. 55.7% of the participants have an “Average’’ level of knowledge, with scores ranging from 7 to 12. Approximately 4.3% of the individuals are classified having “Poor’’ knowledge, scoring between 1 and 6.

Table no.3: Frequency (f) and percentage (%) of preventive measures among caregivers of tuberculosis patients.

PREVENTIVE MEASURES	FREQUENCY(f)	PERCENTAGE (%)	MEAN
Good prevention (9-12)	12	17.1	6.0429
Average prevention (5-8)	50	71.5	
Poor prevention (1-4)	8	11.4	

Table no.3 shows that the mean value is 6.0429 and out of 70 samples, 17.1% belongs to "Good prevention'' category, 71.5% individuals fall in "Average prevention'' group, and 11.4% comes under the "Poor prevention'' category.

Table no.4: chi-square association between level of knowledge with socio-demographic variables.

KNOWLEDGE	CHI VALUE	DF	P VALUE	SIGNIFICANT
Age	40.914	30	.088	Not significant
Gender	6.806	10	.744	Not significant
Marital status	33.739	20	.028	Not significant
Religion	26.727	20	.143	Not significant
Education	29.639	30	.483	Not significant
Occupation	26.674	30	.640	Not significant
Residence	9.548	10	.481	Not significant
Monthly income	41.600	30	.077	Significant
Anybody else in your family affected with tuberculosis	10.905	10	.365	Not significant
Relation with patient	34.699	30	.255	Not significant

The study examines the relationship between socio demographic variables and the level of knowledge among care of TB patients, using chi-square tests for association.

Table no.4 shows that, the p value of Age, Gender, Marital status, Religion, Education, Occupation, Residence, anybody else in your family affected with tuberculosis, and Relation with patient was .088, .744, .028, .143, .483, .640, .481, .365, and .255 respectively which was found to have statistically non-significant association with level of knowledge. Monthly income with p value .077 was found to have statistically association with level of knowledge.

Table no.5: chi-square association between preventive measures with socio-demographic variables.

PREVENTION	CHI VALUE	DF	P VALUE	SIGNIFICANT
Age	20.210	21	.508	Not significant
Gender	2.796	7	.903	Not significant
Marital status	13.884	14	.458	Not significant
Religion	11.699	14	.630	Not significant
Education	29.068	21	.112	Not significant
Occupation	15.406	21	.802	Not significant
Residence	4.241	7	.752	Not significant
Monthly income	16.349	21	.750	Not significant
Anybody else in your family affected with tuberculosis	2.271	7	.943	Not significant
Relation with patient	13.137	21	.904	Not significant

Table no.5 reveals that, the p value of Age, Gender, Marital status, Religion, Education, Occupation, Residence, Monthly income, anybody else in your family affected with tuberculosis, and Relation with patient was .508, .903, .458, .630, .112, .802, .752, .750, .943, and .904 respectively showing statistically non-significant association with preventive measures.

Discussion

The demographic analysis of the caregivers of TB patients in this study reveals that the most of the caregivers (34.3%,) fall within the 26-35 years age group, followed by 36-45 years (31.4%), >45 years (18.6%) and 17-25 years 15.7%. Majority of the caregivers were males (55.7%) and 44.3% females. Among caregivers 75.7% were married, 22.9 % unmarried and only 1.4 % being widow. 68.6 % of the individuals were following Hinduism, 20.0% were Muslims and 11.4 % related to Christianity. According to study findings 12.9% of the caregivers had no formal education, 22.9% with primary level of education, 38.6% having secondary education, and 25.7% college level of education. Of the individuals surveyed 42.9% were private employees, 30.0% housewives, 18.6% farmers and 8.6% being the government employees. Most of the participants were residing in rural areas (67.1%) and 32.9% were from urban areas. Majority of the caregivers (44.3%) were having a monthly income of 30000 INR monthly income. Only a small percentage of the caregivers (12.9%) reported having anybody else in their families affected with tuberculosis, while the majority 87.1% did not have else family member affected with tuberculosis.

Knowledge and prevention assessments show that more than half of the study individuals (55.7%) demonstrate “Average’’ knowledge, with scores between 7 and 12. Of the surveyed participants 40% exhibit “good” knowledge having frequency 28 and scores ranging between 13 to 18. According to study findings only 4.3% caregivers had “Poor” knowledge with a frequency of 3 and scores varying between 1 and 6. The mean knowledge score of level of knowledge is 11.6. Out of 70 samples, 71.5 % caregivers had “Average” preventive measures with a frequency of 50 and scores between 5 and 8. Only 17.1% individuals with frequency 12 and scores ranging between 9 and 12 had “Good’’ preventive measures. Among all the caregivers 11.4% had “Poor” preventive measures with frequency 8 and scores between 1 and 4. The mean prevention score of the preventive measures was 6.0429.

Comparing these results with other studies, a study in 2023 involving 317 residents revealed that nine out of ten respondents (91.8%) knew about tuberculosis. In total, only 2.4% of respondents were knowledgeable about tuberculosis, while over half (59.1%) had positive attitudes toward the disease,

roughly one-third (37.1%) had effective preventive practices, and 22.7% of respondents reported stigma associated with disease. Additionally, 63.6% of respondents said they would never be compassionate toward or want to help those who have TB, and 64.3% would prefer that people with TB never have a job. On the other hand, less stigma resulted from having good knowledge (P <0.001).[17]

Another study involving 415 health and non-health faculty students indicated that 2.4% of non-health faculty students and 18.1% of health faculty students had an adequate knowledge of tuberculosis. Students in the health and non-health faculty groups differed significantly in their knowledge (P value < 0.01). Both health and non-health faculty students had a positive attitude toward tuberculosis (TB) at a rate of 26.7% and 14.9%, respectively. In terms of practices, 29.8% of students from non-health faculty and 41.9% of students from health faculty had positive tuberculosis practices. Between health and non-health faculty students, there was a significant difference in their practices (P value = 0.024) and attitude (P value = 0.03); the latter group exhibited superior knowledge, attitudes, and practices.[18]

The monthly income (Chi value= 41.600, p-value = .077) appears to be associated with the level of knowledge, while most of the other socio-demographic parameters like age, gender, marital status, religion, education, occupation, residence, anybody else in your family affected with tuberculosis and relation with patient having p-value .088, .744, .028, .143, .483, .640, .481, .365, and .255 respectively and Chi values 40.914, 6.806, 33.739, 26.727, 29.639, 26.674, 9.548, 10.905,and 34.699 respectively were found to have non-significant association with the level of knowledge among the caregivers. These findings offer valuable insights about possible variables affecting the respondent's knowledge levels.

The socio-demographic variables including age, gender, marital status, religion education, occupation, residence, monthly income, anybody else in your family affected with tuberculosis, and relation with patient have p- values .508, .903, .458, .630, .112, .802, .752, .750, .943, and .904 respectively and Chi values 20.210, 2.796, 13.884, 11.699, 29.068, 15.406, 4.241, 16.349, 2.271, and 13.137 respectively were found to have statistically non-significant association with the preventive measures among the caregivers of tuberculosis patients.

The study offers valuable insights into the knowledge and preventive measures among the caregivers of TB patients offering a basis for targeted interventions to enhance tuberculosis awareness. In order to better understand the dynamic nature of these factors and develop strategies for enhancing caregiver participation in tuberculosis care, additional research and longitudinal studies are essential.

Limitations of the Study:

Various limitations undermine the robustness of this study. First, the finding's limited generalizability is evident, conducted exclusively in Bhubaneshwar, possibly falling short in capturing the wider diversity of caregivers across various regions. Furthermore, the small sample size of 70 caregivers raises concerns about statistical power, reducing the study's ability to produce conclusive results. The use of convenient sampling introduces selection bias, potentially distorting the representativeness of the sample. Relying on self-reported data poses inherent risks of recall and social desirability biases, impacting the precision of assessments of knowledge and prevention. The descriptive design inhibits the establishment of causation or temporal changes, requiring more thorough comprehension through longitudinal studies in the future. Lastly, time, budget, and access constraints may have limited the study's scope and depth, jeopardizing its capacity to fully examine all relevant aspects.

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Conflict of interest: The authors disclose no conflict of interest.

Ethics Approval:

The study received formal approval from the research committee of SUM Nursing College, ensuring its alignment with established ethical guidelines. Prior to data collection, informed consent was taken from all participating caregivers, emphasizing their voluntary involvement and the right to withdraw at any stage without consequences. Anonymity and confidentiality were diligently maintained throughout the study, safeguarding the privacy of participants and ensuring the secure handling of sensitive data.

The study protocol was allocated Institutional Review Board (IRB) No: SOADU/SNC/IRB/411/2023, attesting to its acceptance and ethical review.

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