

Digital Hoarding Behavior and Its Association with Academic Efficiency and Performance among Medical Students at the University of Khartoum: A Cross-Sectional Study

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Abstract

Background

Digital hoarding (DH) is defined as the excessive accumulation of digital files to the extent that it causes distress and disorganization. Medical students are particularly vulnerable due to the high volume of required academic materials, compounded by conflict-related disruptions and enforced reliance on online learning in low-resource settings such as Sudan. Despite growing global interest, digital hoarding in this context remains unstudied.

Methods

A cross-sectional study was conducted among 328 medical students at the Faculty of Medicine, University of Khartoum, selected by stratified simple random sampling. Data were collected via a self-administered online questionnaire comprising a 13-item digital hoarding behavior (DHB) scale (Cronbach's $\alpha = 0.85$), a 7-item academic efficiency scale (Cronbach's $\alpha = 0.85$), a 5-item research forms accumulation scale (Cronbach's $\alpha = 0.78$), and self-reported GPA. Statistical analyses included descriptive statistics, Pearson's correlation, one-way ANOVA, and chi-square tests.

Results

The mean DHB score was 39.9 (SD = 10.0); 65.5% of participants were classified as moderate-to-high digital hoarders. DHB showed no significant association with GPA ($\chi^2 = 7.28$, $p = 0.302$), but demonstrated a moderate positive correlation with academic inefficiency ($r = 0.535$, $p < 0.001$). High digital hoarders were over five times more likely to report high academic dysfunction compared to low hoarders (54.6% vs. 10.6%). Additionally, 36.9% of students felt overwhelmed by accumulated research forms, and 35.1% reported reduced willingness to participate in future surveys.

Conclusions

Digital hoarding behavior is highly prevalent among medical students at the University of Khartoum. Although not directly associated with GPA, DHB is significantly associated with impaired academic efficiency, suggesting an indirect pathway to academic underperformance. Research forms accumulation represents a novel and underappreciated domain of digital clutter with implications for survey fatigue and research validity. Targeted digital literacy interventions and institutional policies regulating survey distribution are recommended.

Background

Hoarding behavior, historically studied in the context of physical possessions, has increasingly extended into the digital realm. Physical hoarding (PH) is recognized as a psychiatric condition characterized by persistent difficulty discarding objects regardless of their actual value [1]. With accelerating digitalization, an analogous phenomenon—digital hoarding (DH)—has emerged, with surveys suggesting that more than half of device users never delete any stored content [9], and studies on digital data preservation confirming that accumulation tendencies are widespread across academic and professional populations [10]. First documented by Van Bennekom and colleagues in 2015 through a case study of a man who compulsively accumulated thousands of digital photographs [2], DH is defined as the excessive accumulation of digital files to the extent that it causes distress and functional impairment. Similarities between PH and DH include emotional attachment to accumulated items, difficulty discarding them, and resultant disorganization; however, DH differs in that it incurs minimal financial cost and occupies no physical space, making dysfunction less immediately visible [3, 4], yet its environmental and personal costs are increasingly recognized as significant [15, 16]. Physical hoarding has been identified as the strongest direct predictor of DH [5].

Medical students are particularly susceptible to DH. The intense academic pressure of medical training can produce cognitive fatigue, reducing students' capacity to evaluate the usefulness of files and prompting indiscriminate saving to avoid decision-making burden [6]. Additionally, DH may function as a coping mechanism, with students compulsively accumulating resources to manage anxiety about future academic and clinical challenges [7].

The digitalization of medical education—accelerated globally by the COVID-19 pandemic—and the proliferation of online survey requests for research purposes have further compounded information overload and risk of survey fatigue, defined as declining willingness to participate in surveys due to excessive exposure [8].

In Sudan, these vulnerabilities are amplified by an ongoing armed conflict, political instability, and forced reliance on online learning platforms. These contextual factors may drive digital accumulation as a coping response to the perceived threat of losing access to essential materials [7]. Despite growing evidence on DH from diverse international settings, no published data exist on its prevalence or academic impact among Sudanese medical students.

This study therefore aimed to assess the prevalence of digital hoarding behavior, its associations with academic efficiency and GPA, and the perceived burden of accumulated research forms among medical students at the Faculty of Medicine, University of Khartoum.

Methods

Study Design and Setting

A cross-sectional study was conducted between January and April 2026 at the Faculty of Medicine, University of Khartoum (U of K), the oldest and highest-ranked medical school in Sudan, founded in

1924. The faculty enrolls students over a six-year MBBS programme spanning a total population of approximately 1,310 students across active cohorts.

Study Population and Eligibility

The target population comprised medical students from the 3rd to the 6th year (Batches 96–99 and 100) who had completed at least one professional examination. First-year students (Batch 101) were excluded as they had not yet completed a professional exam and therefore had no registerable GPA. Students who did not provide informed consent or who did not use digital devices for academic purposes were also excluded.

Sample Size and Sampling

Sample size was calculated using Cochran's formula for finite populations, with a 95% confidence level ($Z = 1.96$), an estimated proportion of 0.5, and a 5% margin of error ($e = 0.05$), yielding an adjusted sample of 298 participants. A 10% buffer was added to account for non-response, resulting in a final target of 328 participants.

Stratified simple random sampling was applied. The population was stratified by batch number (five strata), and sample allocations were proportional to the size of each batch. Each student was assigned a unique ID; an online random number generator was used to draw participants. Non-responders after three contact attempts were replaced by sequentially drawn backup IDs.

Data Collection Instrument

Data were collected using a structured, self-administered online questionnaire distributed via Google Forms through social media platforms. The questionnaire comprised six sections:

Section A: Informed consent.

Section B: Sociodemographic and academic characteristics (age, gender, batch, GPA, year repetition).

Section C: Digital device ownership and storage practices.

Section D: Digital Hoarding Behavior (DHB) Scale — a 13-item Likert-type scale (1 = Strongly Disagree to 5 = Strongly Agree) modified from a validated digital hoarding scale [27]. Total scores ranged from 13 to 65; higher scores indicate greater hoarding tendencies. Cronbach's α in the pilot study was 0.85.

Section E: Academic Efficiency Scale — a 7-item Likert scale assessing functional impairment of academic activities due to digital file accumulation. Scores ranged from 7 to 35; higher scores reflect greater dysfunction. Cronbach's $\alpha = 0.85$.

Section F: Research Forms Accumulation Scale — a 5-item scale assessing accumulation of research survey links and perceived overwhelm. Scores ranged from 5 to 25. Cronbach's $\alpha = 0.78$.

Instrument development and Validation

The data collection instrument used in this study was developed by the researchers specifically for this study. The Digital Hoarding Behavior scale (13 items) was modified and extended from the standard digital hoarding scale developed by Sillence et al. (2026)[27]. The Academic Efficiency and Functional Impact scale (7 items) and the Research Forms Accumulation scale (5 items) were newly developed by the researchers to address the specific objectives of this study, as no validated instruments measuring these constructs among medical student populations were identified in the existing literature. All items were rated on a 5-point Likert scale ranging from “Strongly Disagree” to “Strongly Agree”.

Content validity of the questionnaire was established through review by the study supervisor, co-supervisor and the social researcher in community medicine department prior to data collection. The scale items were evaluated for clarity, relevance, and appropriateness in capturing the constructs of digital hoarding behavior, academic efficiency, and research forms accumulation among medical students, and feedback from this review was incorporated to refine the wording and structure of the items. Face validity was further assessed during the pilot study, in which participants were asked to comment on the clarity and comprehensibility of the items; their feedback was used to revise any ambiguous wording prior to final data collection.

The internal consistency of the instrument was assessed through the pilot study, yielding Cronbach's Alpha values of 0.85 for both the Digital Hoarding Behavior scale and the Academic Efficiency scale, and 0.715 for the initial 4-item Research Forms Accumulation scale. An additional item addressing participation likelihood was subsequently added to this scale, and its Cronbach's Alpha was recalculated after full data collection using the final 5-item version ($\alpha = 0.78$), indicating acceptable to good internal consistency across all subscales. An English-language version of the questionnaire is provided as a supplementary file.

Scoring and Classification

As no validated clinical cut-offs exist for DH measurement tools, a percentile-based approach was used to classify participants. The 33rd and 66th percentiles of the observed sample distribution were used as thresholds to define three categories: Low ($\leq$ 33rd percentile), Moderate ($>$ 33rd – $\leq$ 66th percentile), and High ($>$ 66th percentile), for DHB, academic efficiency dysfunction, and accumulation scores. Based on the sample, DHB cut-offs were 35.0 and 45.0, academic efficiency cut-offs were 18.0 and 23.0, and accumulation cut-offs were 11.0 and 15.0.

Self-reported GPA was collected as categorical data (≥ 4.5 , 4.0–4.49, 3.0–3.99, 2.0–2.99, $<$ 2.0) and converted to continuous midpoint values for parametric analysis, as the faculty does not use a formal

GPA scale. Each GPA range was mapped to its corresponding academic standing (Distinction, Very Good, Good, Pass, At-risk).

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics (frequencies, percentages, means, standard deviations) were used to characterize the sample. Pearson's correlation coefficient was calculated between DHB and academic efficiency scores. One-way ANOVA compared DHB category groups on continuous GPA and efficiency scores. Chi-square tests assessed associations between categorical variables. Spearman's rho examined the relationship between feeling overwhelmed by research forms and reduced participation intent. A p-value < 0.05 was considered statistically significant for all tests. Post-hoc comparisons (Tukey's HSD) were planned for significant ANOVA results.

Ethical Considerations

Ethical approval

for this study was granted by the Department of Community Medicine, Faculty of Medicine, University of Khartoum (Approval ID: COMMED 2026-97-140, dated 10 May 2026). The study protocol was reviewed and approved by the professors' staff of the department, headed by the Head of the Department, Dr. Amani Abdelrahman Sidahmed Burbur. The study complied with all relevant regulations and guidelines to ensure no harm to participants. Informed consent was obtained electronically from all participants prior to their inclusion in the study, and participation was entirely voluntary. Confidentiality and anonymity were maintained by not collecting any personally identifiable information.

Results

Participant Characteristics and Storage Practices

A total of 328 students participated. The mean age was 22.8 years (SD = 1.6; range: 20–27), with a female predominance (230/328, 70.1%). Most participants were in the 4th (79, 24.1%) and 6th (75, 22.9%) academic years. The largest proportion reported a GPA of 4.0–4.49 (143, 43.6%), followed by 3.0–3.99 (108, 32.9%), and 18.6% had achieved Distinction (≥ 4.5). Only 7 students (2.1%) had repeated an academic year. Participant characteristics are summarized in Table 1.

Table 1
Sociodemographic and Academic Characteristics of
Participants (N = 328)

Characteristic	Overall (N = 328)
Age in years, Mean (SD)	22.8 (1.6), range: 20–27
Gender	
Female	230 (70.1%)
Male	98 (29.9%)
Academic Year (Batch)	
6th year (Batch 96)	75 (22.9%)
5th year (Batch 97)	68 (20.7%)
4th year (Batch 98)	79 (24.1%)
3rd year B (Batch 99)	55 (16.8%)
3rd year A (Batch 100)	51 (15.5%)
GPA (Previous Academic Year)	
≥ 4.5 (Distinction)	61 (18.6%)
4.0–4.49 (Very Good)	143 (43.6%)
3.0–3.99 (Good)	108 (32.9%)
< 2.0 (At risk/Repeat)	16 (4.9%)
Repeated an academic year: No	321 (97.9%)

Smartphones were the most commonly owned device (300, 91.5%) and the primary storage tool for academic materials (140, 42.7%). Telegram was the dominant storage platform (301, 91.8%), markedly exceeding structured cloud services such as Google Drive (52, 15.9%). Internal device storage was used by 161 students (49.1%).

Prevalence and Classification of Digital Hoarding Behavior

The mean DHB score was 39.9 (SD = 10.0; range: 17–60). Using percentile-based cut-offs, 108 participants (32.9%) were classified as high digital hoarders, 107 (32.6%) as moderate, and 113 (34.5%) as low, indicating that 65.5% engaged in at least moderate-level DHB. The most frequently reported behaviors were collecting materials believed to be potentially useful in the future (261/328, 79.6%), accumulating materials that may never be read (253/328, 77.1%), and forwarding materials to personal saved channels without reviewing them (241/328, 73.5%). Emotional dimensions were prominent: (190/328, 57.9%) reported anxiety about deleting files, and (157/328, 47.9%) felt psychological discomfort at the prospect of losing stored materials.

Academic Efficiency

The mean academic efficiency score was 20.4 (SD = 5.9; range: 7–35). High dysfunction was recorded in 103 participants (31.4%), moderate dysfunction in 101 (30.8%), and low dysfunction in 124 (37.8%). Common impairments included difficulty concentrating due to large volumes of stored materials (153/328, 46.6%), excessive time spent searching for files (109/328, 33.2%), stress related to stored academic content (133/328, 40.5%), and poor file organization (121/328, 36.9%).

Research Forms Accumulation

The mean accumulation score was 13.2 (SD = 4.4; range: 5–25). High problematic accumulation was identified in 91 students (27.7%), moderate in 110 (33.5%), and low in 127 (38.7%). While most students did not exhibit strongly problematic accumulation behaviors, (36.9%) reported feeling overwhelmed by accumulated research links, and (35.1%) reported that this accumulation made them less likely to participate in new surveys. Score distributions and classifications are presented in Table 2.

Table 2
Digital Hoarding Behavior, Academic Efficiency, and Research Forms
Accumulation Scores and Classifications (N = 328)

Variable	Overall (N = 328)
DHB Score, Mean (SD)	39.9 (10.0), range: 17–60
DHB Classification	
High Digital Hoarding	108 (32.9%)
Moderate Digital Hoarding	107 (32.6%)
Low Digital Hoarding	113 (34.5%)
Academic Efficiency Score, Mean (SD)	20.4 (5.9), range: 7–35
Academic Efficiency Classification	
High Dysfunction	103 (31.4%)
Moderate Dysfunction	101 (30.8%)
Low Dysfunction	124 (37.8%)
Accumulation Score, Mean (SD)	13.2 (4.4), range: 5–25
Accumulation Classification	
High Problematic Accumulation	91 (27.7%)
Moderate Problematic Accumulation	110 (33.5%)
Low Problematic Accumulation	127 (38.7%)

Association Between DHB, Academic Metrics, and Accumulation

DHB level showed no significant association with GPA ($\chi^2(6) = 7.28, p = 0.302$), with comparable GPA distributions across high, moderate, and low hoarders. In contrast, DHB was significantly associated with academic efficiency dysfunction ($\chi^2(4) = 81.06, p < 0.001$). High academic dysfunction was most prevalent in high digital hoarders (59/108, 54.6%) compared to moderate (31/107, 29.0%) and low hoarders (12/113, 10.6%), while low dysfunction predominated in the low hoarding group (75/113, 66.4%).

DHB category was also significantly associated with accumulation classification ($\chi^2(4) = 36.18, p < 0.001$): high problematic accumulation was most frequent among high hoarders (47/108, 43.5%) compared to moderate (29/107, 27.1%) and low hoarders (15/113, 13.3%). Full associations are presented in Table 3.

Table 3
Association Between Digital Hoarding Level and Academic Metrics (N = 328)

Variable	N	High DH (n = 108)	Moderate DH (n = 107)	Low DH (n = 113)
Last GPA	328			
Distinction (≥ 4.5)		19 (17.6%)	19 (17.8%)	23 (20.4%)
Very Good (4.0–4.49)		40 (37.0%)	53 (49.5%)	49 (43.4%)
Good (3.0–3.99)		45 (41.7%)	30 (28.0%)	33 (29.2%)
At risk (< 2.0)		4 (3.7%)	5 (4.7%)	8 (7.1%)
Test statistic		$\chi^2(6) = 7.28, p = 0.302$		
Academic Efficiency	328			
High Dysfunction		59 (54.6%)	31 (29.0%)	12 (10.6%)
Moderate Dysfunction		34 (31.5%)	42 (39.3%)	26 (23.0%)
Low Dysfunction		15 (13.9%)	34 (31.8%)	75 (66.4%)
Test statistic		$\chi^2(4) = 81.06, p < 0.001$		
Accumulation Classification	328			
High Problematic		47 (43.5%)	29 (27.1%)	15 (13.3%)
Moderate Problematic		24 (22.2%)	48 (44.9%)	38 (33.6%)
Low Problematic		37 (34.3%)	30 (28.0%)	60 (53.1%)
Test statistic		$\chi^2(4) = 36.18, p < 0.001$		

Pearson's correlation confirmed a moderate positive correlation between DHB and academic inefficiency scores ($r = 0.535, p < 0.001$), a weaker but significant correlation between DHB and accumulation ($r = 0.250, p < 0.001$), and a moderate correlation between academic inefficiency and accumulation scores ($r = 0.450, p < 0.001$). These are summarized in Table 4.

Table 4
Pearson Correlation Coefficients Between DHB, Academic Efficiency, and Accumulation Scores

Correlation Pair	Pearson r	p-value
DHB Score × Academic Efficiency Score	0.535	< 0.001
DHB Score × Accumulation Score	0.250	< 0.001
Academic Efficiency Score × Accumulation Score	0.450	< 0.001

Sociodemographic Factors and DHB

There were no significant associations between DHB classification and gender ($\chi^2(2) = 0.32$, $p = 0.852$), academic year ($\chi^2(8) = 7.91$, $p = 0.442$), primary device type ($\chi^2(6) = 6.84$, $p = 0.342$), or number of devices owned ($F(2,325) = 0.78$, $p = 0.461$).

Discussion

This study provides the first empirical data on digital hoarding behavior and its academic implications among medical students at the University of Khartoum. The prevalence of at least moderate-level DHB was 65.5%, and the behavior was significantly associated with impaired academic efficiency, though not with GPA directly. Research forms accumulation was identified as a novel and clinically relevant sub-domain of digital hoarding in academic settings.

Prevalence of Digital Hoarding Behavior

The high prevalence found in this study aligns with regional findings. A study by Jarwan and Al-Shatnawi (2025) among 1,037 students in Jordan and Oman reported moderate DHB driven by a psychological need to preserve materials for future use [17]. Similarly, a Turkish study among Firat University students linked DH to consumption-oriented digital clutter facilitated by the ease of saving [18]. The near-equal distribution across DHB categories in the present sample, however, may reflect the unique context of Sudanese medical education—marked by conflict, displacement, internet instability, and forced online learning—which can heighten DH as a coping mechanism against the perceived threat of losing access to academic materials [7].

The predominant behavioral patterns—saving materials unlikely to be revisited (77.1%), belief in future utility of all accumulated files (79.6%), and forwarding to private channels without retrieval (73.5%)—are consistent with the “just in case” phenomenon and fear of missing out (FoMO) described across international literature [19, 20]. Wang et al. (2023) demonstrated that FoMO mediates the relationship between social comparison and digital accumulation [21]. The emotional dimension evident in this cohort, including file-deletion anxiety (57.9%) and distress at the prospect of material loss (47.9%), mirrors findings from academic populations in Turkey and the United Kingdom [11, 19].

A particularly notable finding was that 42.1% of students associated deleting academic files with losing part of their academic identity, reflecting an identity-based motivation consistent with Kaye et al.'s (2006) observation that individuals accumulate digital content to construct personal legacy and manage existential anxiety [22]. This dimension may make digital decluttering especially challenging in high-stakes academic environments.

Digital Hoarding and Academic Efficiency

The moderate positive correlation between DHB and academic inefficiency ($r = 0.535$, $p < 0.001$) is the primary academic finding of this study. High digital hoarders were more than five times as likely to exhibit high academic dysfunction compared to low hoarders (54.6% vs. 10.6%). These findings are mechanistically supported by Liu and Liu (2025), who demonstrated that DH predicts cognitive failure among 801 college students in China, both directly and indirectly through fatigue [13]. The accumulation of digital materials generates cognitive overload that taxes working memory, executive function, and attention—faculties critical in medical training. Bai et al. (2025) further identified an “information paradox,” wherein hoarding behavior paradoxically increases rather than reduces cognitive strain [23].

The stress and overwhelm reported by 40.5% of students related to stored academic content, while not directly measured as mental health outcomes, are consistent with Khan et al.'s (2023) finding that DH predicts depression, anxiety, and stress in university students [12]. These psychological consequences likely mediate the pathway from DHB to academic inefficiency observed here.

Digital Hoarding and Academic Performance

Contrary to initial hypotheses, no significant direct association was found between DHB and GPA ($\chi^2 = 7.28$, $p = 0.302$). This is consistent with Bravo-Adasme et al. (2025), who found that DH does not directly affect academic performance but does so indirectly through academic burnout [14]. The absence of a direct GPA association should not be interpreted as evidence that DH is inconsequential for academic outcomes; rather, it suggests that DHB operates through mediating pathways—such as efficiency impairment, fatigue, and burnout—that may not yet manifest in measurable GPA differences within a cross-sectional study.

Research Forms Accumulation and Survey Fatigue

This study uniquely examined research forms accumulation as a specific manifestation of DHB with direct implications for academic research. Over a third of students reported feeling overwhelmed by accumulated survey links (36.9%) and reduced willingness to participate in new surveys (35.1%), and a significant positive correlation was found between accumulation scores and academic efficiency impairment ($r = 0.450$, $p < 0.001$). These findings are corroborated by survey fatigue literature: Adams and Umbach (2012) demonstrated a sharp decline in survey response rates when students receive 11 or more surveys [24], and Zhang et al. (2025) showed that high survey density in short periods produces steeper longitudinal response declines [25], and Porter et al. (2004) similarly identified survey fatigue as a measurable threat to institutional research validity [26].

Storage Platforms and Device Use

The dominance of Telegram as a storage platform (91.8%) is a contextually important finding. As a communication application rather than a document management system, Telegram's "Saved Messages" feature facilitates effortless forwarding without organizational structure, which likely compounds retrieval difficulties and disorganization. The absence of significant associations between DHB and device type ($p = 0.342$) or number of devices ($p = 0.461$) supports the view that DH is fundamentally a psychological and behavioral phenomenon rather than one driven by technological access.

Gender and Academic Year

No significant associations were found between DHB and gender ($p = 0.852$) or academic year ($p = 0.442$). This cross-cultural consistency—replicated in studies from Turkey [28], Saudi Arabia [29], Jordan, and Oman [17]—underscores that DHB is driven by psychological and environmental factors rather than demographic variables.

Strengths and Limitations

This study has several strengths. It is the first to examine DHB in a Sudanese medical education setting, addressing a significant research gap in a conflict-affected, low-resource context. Stratified random sampling across academic years ensures representativeness within the faculty. The instruments demonstrated acceptable-to-excellent internal consistency (Cronbach's $\alpha = 0.78\text{--}0.85$). The study also introduces research forms accumulation as a measurable sub-construct of DH relevant to academic contexts.

Limitations include the cross-sectional design, which precludes causal inference. GPA was self-reported using a categorical proxy scale, introducing potential recall and classification bias. DHB classification relied on sample-derived percentile cut-offs rather than validated diagnostic thresholds. The single-institution sample limits generalizability. Psychological mediators such as perfectionism, anxiety, and decision fatigue were not directly measured.

Conclusions

Digital hoarding behavior is highly prevalent among medical students at the University of Khartoum, with nearly two-thirds exhibiting at least moderate-level DHB. While DHB was not directly associated with GPA, it demonstrated a clinically meaningful positive correlation with impaired academic efficiency, suggesting that its impact on academic outcomes operates through indirect pathways including cognitive overload, fatigue, and disorganization. This study also highlights research forms accumulation as an understudied but meaningful domain of digital clutter that contributes to survey fatigue and threatens research participation rates.

Students are encouraged to develop intentional digital organization habits, using structured cloud storage platforms rather than messaging applications. Institutions should consider incorporating digital information literacy into the medical curriculum and establishing policies regulating the frequency of survey distribution to students. Future longitudinal and qualitative research should explore the psychological drivers of DHB and evaluate the effectiveness of targeted digital hygiene interventions in medical education settings.

Abbreviations

DH	Digital Hoarding
DHB	Digital Hoarding Behavior
FoMO	Fear of Missing Out
GPA	Grade Point Average
PH	Physical Hoarding
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
U of K	University of Khartoum

Declarations

Ethics approval and consent to participate

Ethical approval for this study was granted by the Research Ethics Committee, Department of Community Medicine, Faculty of Medicine, University of Khartoum (Approval ID: COMMED 2026-97-140, dated 10 May 2026). The study protocol was reviewed and approved by the professors' staff of the department, headed by the Head of the Department, Dr. Amani Abdelrahman Sidahmed Burbur. All participants provided written informed consent electronically prior to their inclusion in the study, and participation was entirely voluntary. Confidentiality and anonymity were maintained by not collecting any personally identifiable information. The study was conducted in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

SAYFA conceived and designed the study, collected the data, performed the statistical analysis, and drafted the manuscript. ZIS supervised the study design, provided methodological guidance, and critically revised the manuscript for important intellectual content. SMYF contributed to the study design and critically revised the manuscript. All authors read and approved the final manuscript.

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Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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