




Severity of Wound-Related Pain and Associated Factors Among Patients Who Underwent Wound Management at Teaching and Referral Hospital, Northwest Ethiopia

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Background: Wound management is one of the commonly performed procedures in hospitals. It can be a major source of pain and pain may be a frequently experienced but under-considered component of wound management. Therefore, we aimed to determine the severity of wound-related pain and identifying factors associated with it among patients who underwent wound management.

Patients and Methods: An institutional-based, cross-sectional study was conducted from March to May, 2020 in the University of Gondar Comprehensive Specialized Hospital. A total of 424 patients were included in this study. Data were collected by direct observation, chart review, and interview of patients by using questionnaires. Statistical analysis had performed using SPSS 25.00 version statistical software. Descriptive statistics were conducted to summarize patients' information and to determine the prevalence of pain. Bi-variable analysis was performed to determine each of the independent variables and only variables with a P -value <0.2 were entered into the multivariable analysis. The strength of the association was present by odds ratio and 95% Confidence interval. P -value <0.05 was considered as statistically significant.

Results: The prevalence of moderate-to-severe wound-related pain during wound management was 94.1% (95% CI=91.7–96.2). Anxiety (AOR=18.16; 95% CI=4.83–68.23), acute wound (AOR=11.49; 95% CI=1.013–130.2), baseline pain (AOR=3.51; 95% CI=1.18–10.46), and analgesia intake (AOR=0.026; 95% CI=0.001–0.895) were significantly associated with the severity of wound-related pain.

Conclusion: The prevalence of moderate-to-severe wound-related pain was considerably high. Anxiety, type of wound, baseline pain, and analgesia intake were the independent risk factors. Therefore, wound care providers should assess the severity of wound-related pain and manage accordingly. Additionally, more emphasis should be given for patients who have baseline pain, anxiety, and acute wound.

Keywords: pain assessment, pain management, wound management

Background

Wound is disruption of structural and functional integrity of tissue¹. Skin is considered as the largest organ in the body and damage to the skin may alter its functions which can have catastrophic consequences for the patient. Patients having wound at hospital may need wound management in order to fasten wound healing.²

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Wound management is the process of removing dead tissue, cleansing the wound or providing a protective environment.³ The most common wound management performed on open wounds are dressing changes and wound cleansing.⁴ It is a major source of wound-related pain, which may be frequently experienced but overlooked.⁵

Dressing change causes moderate-to-severe wound-related pain in 74% of patients, nearly half (36%) of them had experienced severe pain which was associated with patient factors like young age, female sex, anxiety, depression and wound-related factors like recent tissue loss, inflammatory wound, baseline wound pain, chronic pain, chronic wound, and partial thickness wound^{4,6}. In addition, factors like size of wound, types of cleansing agents, location of the wound, duration of wound management, and not using analgesics/sedatives were also found to be associated with pain during wound management.⁷ Despite the increase in quality of pain management, wound management related pain is still poorly managed because of different reasons.⁸ An international comparative survey on wound-related pain found that practitioners in the wound care service tend to focus on healing processes rather than considering patient's total pain experience involving an appropriate pain assessment and selection of an appropriate pain management strategy.⁹ Studies had found that baseline pain and treatment adequacy were not assessed by wound care providers which resulted in inadequate pain management during wound management.^{10–13}

Untreated pain can result in a number of potentially serious events including; delayed mobilization, delayed recovery, cardiac complications, thrombosis, pulmonary complications, stress, anxiety, depression, psychosocial problems, delayed wound healing, and chronic pain syndromes.¹⁴

A simple evidence based pharmacological technique was offered as a potential strategie to minimize the experience of pain. Moderate-to-severe wound-related pain was usually treated with opioids and acetaminophen, whereas inflammatory pain was responded better with non-steroidal anti-inflammatory drugs (NSAIDs).⁷ Combination analgesic therapy for wound-related pain had been found to give better analgesia during wound care procedures.^{15,16}

Pain management practice during wound management can be improved through determining the severity of wound-related pain (WRP) and identifying contributing factors for it. Thus, adequate wound-related pain

prevention and management may improve patient satisfaction via hastened wound healing, reducing hospital stay, and cost¹⁷. Therefore, this study aimed to assess the severity of wound-related pain (WRP) and its associated factors during wound management.

Patients and Materials

Ethical approval was obtained from the University of Gondar, School of Medicine ethical review committee (Ref No: 1926/03/2020). Written informed consent was obtained from the participants. An institutional based cross-sectional study was conducted among patients who underwent wound management from March–May, 2020 at University of Gondar Comprehensive Specialized Hospital mainly in surgical, trauma, orthopedic, and gynecologic wards.

All adult patients who underwent wound management during the study period were included in the study. Patients who had chronic pain, burn injury, diabetic wound ulcer pain, psychosis, and patients with sensory impairment were excluded.

Variables of the Study

Dependent Variable

Severity of pain (the maximum pain experienced) during wound management was assessed in terms of the verbal rating scale (VRS) pain assessment tool.

Independent Variables

Patient Related Factors

Age, gender, anxiety measured via Six-item state-trait anxiety inventory and depression assessed through personal health questionnaire depression scale.

Clinical/Procedure Related Factors

Duration of WCPs, cleansing solutions used, and using analgesics/sedatives.

Wound-Related Factors

Size of the wound, location of the wound, baseline wound pain, chronic wound pain, type of wound, depth of wound, sign of clinical inflammation, and recent injury of wound.

Operational Definitions

Verbal Rating Scale

A pain assessment scale that consists of a list of describing words about severity of pain (no pain, mild pain, moderate pain, and severe pain). The VRS has high validity and reliability for assessing acute pain. The VRS is one of the

most appropriate pain assessment tools for use in adults experiencing procedural pain like WCP since VRS is simple, easy to understand, and a low failure rate than both numeric rating scale and visual analog scale.¹⁸⁻²¹

Wound Management

It includes dressing changes and wound cleansing.

Chronic Wounds

Wounds that lasts ≥ 3 months were considered as chronic wounds.²²

Chronic Wound Pain

Wound pain that lasts for ≥ 3 months was considered as chronic wound pain.²³

Sensory Impairment

Defined as a lack of sharp vs dull sensation around the wound, especially in a diabetic foot.²⁴

Partial Thickness Wounds

Are wounds that extend only into the first two layers of skin, the epidermis, dermis, or both.²⁵

Recent Injury

The inflammatory period is proposed to last 3–5 days in acute wounds.²⁶

Six-Item State-Trait Anxiety Inventory

This is the short-form of the STAI, which is the most frequently used measure of anxiety. When compared with the full form of the STAI, the six-item version offers a briefer and just as acceptable scale for subjects while maintaining results that are comparable to those obtained using the full form of the STAI. It is a reliable and sensitive measure of anxiety. To calculate the total score, sum all six scores and multiply by 20/6 then you can get a score from 20–80. A total value greater than 20 is considered as having anxiety.²⁷

Personal Health Questionnaire Depression Scale (PHQ-9)

This is established as a reliable and valid diagnostic measure for depression among Ethiopian adults. The total score for the nine questions are added up and can range from 0–27. A score of 5 or greater can be considered for defining current depression.²⁸

Sample Size Calculation and Sampling Techniques

The sample size was calculated using a single population proportion formula

$$n = (Z_{\alpha/2})^2 \times \frac{p(1-p)}{d^2}$$

where n is the minimum sample size, Z is the standardized normal distribution value at $\alpha/2$, p is the prevalence/proportion of pain, and d is the margin of error. Let p denote the proportion of success. Since there was no previous study regarding the incidence or severity of pain during wound care in Ethiopia, we took the 50% ($P=0.5$), Maximum acceptable difference (d)=5%, desired confidence level: at 95% confidence level and 10% of non-response rate. Therefore, sample size was

$$n=(1.96)^2 \times 0.5(1-0.5)/0.05^2$$

where $n= 384.16 \sim 385$: non-response rate=10%, $384.16 \times 10\% = 38.416 \sim 39$. The total sample size was $385 + 39 = 424$ patients were included in this study.

All consecutive patients who fulfilled the inclusion criteria and who had undergone wound management until the calculated sample size was reached were selected.

Data Collection Procedure and Data Quality Control

Data were collected after the completion of wound management by using a semi-structured questionnaire. The questionnaire was including direct observation, chart review, interview of the patient, and wound care provider.

To ensure the quality of data, training had given for three data collectors and one supervisor. To ensure a quality questionnaire, a pretest was done on 22 patients and the necessary corrections were made on the questionnaire for the main study. Pretested respondents were not included in the main study. The data collectors were supervised daily; the filled questionnaires were checked every day for completeness and clarity by the supervisor and the principal investigator.

Data Analysis and Interpretation

Sociodemographic variables, severity of wound-related pain, and associated factors of wound-related pain were entered to Epidata 3.1 version and it was transferred to SPSS 25.00 version statistical software for analysis. Descriptive statistics were conducted to summarize patients' information and to determine the prevalence of wound-related pain (WRP). To determine the association between severities of wound-related pain with potential predictors, the chi-square test was employed. Binary logistic regression analysis was conducted to identify factors associated with severity of wound-related pain (WRP) and bi-variable

analysis was performed to determine each of the independent variables. Only variables with a P -value < 0.2 during bi-variable analysis were entered into the multivariate analysis. We have used the Hosmer Lemeshow test of goodness of fit to check the appropriateness of the model for analysis. The strength of the association was presented by adjusted odds ratio and 95% Confidence interval. Finally, data is presented by using numbers or frequencies, percentages, figure, and tables. P -values < 0.05 were considered as statistically significant.

Results

Socio-Demographic Characteristics

A total of 424 patients aged 20–80 years who underwent wound management were included. Of these, 268 (63.2%) were males and the remaining 156 (36.8%) were females. Among those patients, 403 (95%) were aged < 55 years, while 21 (5%) were aged ≥ 55 years (Table 1).

The Prevalence of Pain During Wound management

In this study, all patients experienced mild-to-severe wound-related pain (WRP) during wound management.

Table 1 Sociodemographic Characteristics of the Study Participants at UOGCSH, Ethiopia (n=424)

| Variables | Category | Frequency (N) | Percent (%) |
|--------------------|--------------------|---------------|-------------|
| Age | < 55 | 403 | 95 |
| | ≥ 55 | 21 | 5 |
| Sex | Male | 268 | 63.2 |
| | Female | 156 | 36.8 |
| BMI | ≤ 18.5 | 35 | 8.3 |
| | 18.5–24.9 | 378 | 89.2 |
| | > 24.9 | 11 | 2.5 |
| Educational status | Illiterate | 171 | 40.3 |
| | Can read and write | 50 | 11.8 |
| | Primary school | 86 | 20.3 |
| | Secondary school | 74 | 17.5 |
| | College and above | 43 | 10.1 |
| Residence | Urban | 143 | 33.7 |
| | Rural | 281 | 66.3 |
| Marital status | Single | 104 | 24.5 |
| | Married | 307 | 72.4 |
| | Divorced | 13 | 3.1 |

Abbreviation: BMI, body mass index.

Of these patients, 25 (5.9%), 116 (27.4%), and 283 (66.7%) experienced mild, moderate, and severe wound-related pain, respectively. A total of 399 (94.1%) patients developed moderate-to-severe wound-related pain (95% CI=91.7–96.2) (Figure 1).

Factors Associated with Severity of Wound-Related Pain (WRP) During Wound Management

Patient Related Factors

The majority of patients aged < 55 years old experienced moderate-to-severe wound-related pain (380, 89.6%). Two hundred and fifty-six (60.4%) male patients reported moderate-to-severe wound-related pain (WRP). Most of the patients who had anxiety and depression were associated with moderate-to-severe wound-related pain, which accounted for 83.5% and 67.5%, respectively (Table 2).

Wound-Related Factors

The majority of patients (292, 68.9%) who had baseline wound pain experienced moderate-to-severe wound-related pain during wound management. Among 33 patients having symptoms of inflammatory wound, 32 (7.5%) of them had reported moderate-to-severe WRP. The majority of patients (399, 94.1%) had partial thickness wounds, and 377 (88.9%) of them had experienced moderate-to-severe WRP during wound management (Table 3).

Procedure Related Factors

The majority of patients (398, 93.9%) did not receive analgesia and reported moderate-to-severe wound-related pain during wound management. Most of the patients (355, 83.7%) whose wound management took ≥ 14 minutes had associated moderate-to-severe WRP (Table 4).

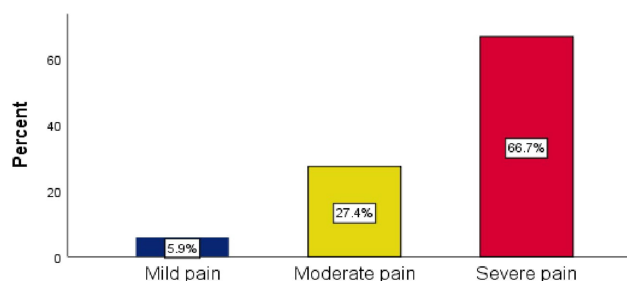


Figure 1 Prevalence of wound-related pain.

Table 2 Patient Related Factors and Severity of Wound-Related Pain During Wound Management in UOGCSH, Ethiopia (N=424)

| Variables | Category | Frequency (%) | Mild Pain | Moderate-to-Severe Pain (N, %) |
|-------------|----------|---------------|-----------|--------------------------------|
| | | | (N, %) | |
| Age (years) | <55 | 403 (95) | 23(5.4) | 380 (89.6) |
| | ≥55 | 21 (5) | 2 (0.5) | 19 (4.5) |
| Sex | Male | 268 (63.2) | 12 (2.8) | 256 (60.4) |
| | Female | 156 (36.8) | 13 (3.1) | 143 (33.7) |
| Anxiety | Yes | 363 (85.6) | 9 (2.1) | 354 (83.5) |
| | No | 61 (14.4) | 16 (3.8) | 45 (10.6) |
| Depression | Yes | 295 (69.6) | 9 (2.1) | 286 (67.5) |
| | No | 129 (30.4) | 16 (3.8) | 113 (26.7) |

Factors Associated with Moderate-to-Severe WRP During Wound Management

The bi-variable logistic regression showed that age, anxiety, depression, type of wound, baseline pain, depth of wound, duration of wound management, and analgesia intake were associated with moderate-to-severe WRP during wound management at a P -value<0.2.

Baseline wound pain, analgesia intake, acute wound, and anxiety were significantly associated with moderate-to-severe WRP during wound management in multi-variable logistic regression at a P -value<0.05.

The odds of moderate-to-severe WRP wound management among patients who had experienced baseline wound pain were 3.51 (AOR=3.51; 95% CI=1.18–10.46, P -value=0.024) times higher as compared to patients who did not have baseline wound pain. The odds of moderate-to-severe WRP during wound management among patients who received analgesia were 97.4% (AOR=0.026; 95% CI=0.001–0.895, P -value=0.043) lower as compared to patients who did not receive analgesia.

The odds of moderate-to-severe WRP among patients who had acute wounds were 11.49 (AOR=11.49; 95% CI=1.013–130.2, P -value=0.049) times higher as compared to patients having chronic wounds. The odds of moderate-to-severe WRP during wound management among patients who have anxiety was 18.16 (AOR=18.16; 95% CI=4.83–68.23, P -value=0.000) times higher as compared to patients who did not have anxiety (Table 5).

Table 3 Wound-Related Factors and Severity of Wound-Related Pain During Wound Management at UOGCSH, Ethiopia (N=424)

| Variables | Category | Frequency (%) | Mild Pain | Moderate-to-Severe Pain (N, %) |
|------------------------------|-------------------|---------------|-----------|--------------------------------|
| | | | (N, %) | |
| Type of wound | Acute | 420 (99.1) | 23 (5.4) | 397 (93.6) |
| | Chronic | 4 (0.9) | 2 (0.5) | 2 (0.5) |
| Baseline pain | Yes | 300 (70.8) | 8 (1.9) | 292 (68.9) |
| | No | 124 (29.2) | 17 (4.0) | 107 (25.2) |
| Primary cause of wound | Surgery | 175 (41.3) | 12 (2.8) | 163 (38.4) |
| | Trauma | 234 (55.2) | 12 (2.8) | 222 (52.4) |
| | Burn | 15 (3.5) | 1 (0.2) | 14 (3.3) |
| Wound size (m ²) | <0.01 | 274 (64.6) | 20 (4.7) | 254 (59.9) |
| | ≥0.01 | 150 (35.4) | 5 (1.2) | 145 (34.2) |
| Sign of inflammation | Yes | 33 (7.8) | 1 (0.2) | 32 (7.5) |
| | No | 391 (92.2) | 24 (5.7) | 367 (86.6) |
| Depth of wound | Partial thickness | 399 (94.1) | 22 (5.2) | 377 (88.9) |
| | Full thickness | 25 (5.9) | 3 (0.7) | 22 (5.2) |

Discussion

The purpose of this study was to find the severity of WRP during wound management and to establish a relationship between the patient-related factors, wound-related factors, and wound management-related factors as predictors of WRP severity.

In this study, moderate-to-severe WRP was reported in 94.1% of the patients, which was considerably high as compared to other studies. A study done at the University of Iowa, USA in 2017 found that 74% of the patients experienced prevalence of moderate-to-severe pain during wound care procedures which was lower than our result.⁴ Another study done in the USA in 2018 also found a 74% prevalence of moderate-to-severe pain during wound care procedures.⁶ In addition, a study done in France in 2004 showed that the prevalence of moderate-to-severe pain was reported in 79.9% of the patients.²⁹ Furthermore, 81% of the patients who underwent ae wound care procedure had experienced severe pain at dressing change according to a study done in the USA in 2004.³ The high prevalence of moderate-to-severe pain during wound care procedures in this study area might possibly be due to inconsistent use of analgesics.

Table 4 Wound Management Related Factors and Severity of WRP at UOGCSH, Ethiopia (N=424)

| Variable | Category | Frequency (%) | Mild Pain | Moderate-to-Severe Pain |
|--|-------------------------------|---------------|-----------|-------------------------|
| | | | (N, %) | (N, %) |
| Analgesics given | Yes | 2 (0.5) | 1 (0.2) | 1 (0.2) |
| | No | 422 (99.5) | 24 (5.7) | 398 (93.9) |
| Wound cleansing agent | Normal saline | 54 (12.7) | 2 (0.5) | 52 (12.3) |
| | H ₂ O ₂ | 370 (87.3) | 23 (5.4) | 347 (81.8) |
| Duration of Wound Management (minutes) | <14 | 50 (11.8) | 6 (1.4) | 44 (10.4) |
| | ≥14 | 374 (88.2) | 19 (4.5) | 355 (83.7) |

Abbreviation: H₂O₂, hydrogen peroxide.

In the current study, baseline wound pain, analgesia intake, type of wound, and anxiety were significantly associated with moderate-to-severe pain in multivariable logistic regression.

The result of our study showed that patients who had experienced baseline wound pain had higher odds of moderate-to-severe WRP during wound management than patients who did not have baseline wound pain. Evidence shows that pain was often exacerbated by procedures like dressing changes and wound cleansing. So, a substantial proportion of patients also experienced wound-related pain at rest, and this clinical problem is anticipated, therefore, clinicians should assess and manage this on a regular basis.³⁰ Inadequate management of baseline wound pain was one of the main reasons to experience moderate-to-severe WRP during wound management.³¹ A study done in the USA in 2002 showed that patients with baseline wound pain were more likely to experience severe WRP and received opiates before and/or during wound management than patients who had no baseline wound pain.³² This might possibly be because the mechanical manipulation of the wound during wound management stimulates sensitized nociceptors through mechanoreceptors in the wound bed, resulting in higher pain.

In this study, patients who received analgesia had lower odds of moderate-to-severe WRP during wound management than patients who did not receive analgesia. Inconsistent with our result, another study showed that 84.1% of patients who reported moderate-to-severe WRP received analgesics during the procedure and the pain

Table 5 Bivariate and Multivariate Logistic Regression Analysis of Factors Associated with Moderate-to- Severe WRP During Wound Management at UOGCSH, Ethiopia (n=424)

| Variables | COR (95% CI) | AOR (95% CI) |
|-----------------------------|---------------------|-----------------------|
| Baseline pain | | |
| Yes | 5.8 (2.43–13.83) | 3.51 (1.18–10.46)** |
| No | | I |
| Analgesics given | | |
| Yes | 0.06 (0.004–0.994) | 0.026 (0.001–0.895)** |
| No | | I |
| Type of wound | | |
| Acute | 17.26 (2.32–128.1) | 11.49 (1.013–130.2)** |
| Chronic | | I |
| Anxiety | | |
| Yes | 13.99 (5.84–33.5) | 18.16 (4.83–68.23)** |
| No | | I |
| Depth of wound | | |
| Partial thickness | 2.34 (0.65–8.41) | 2.73 (0.55–13.51) |
| Full thickness | | I |
| Depression | | |
| Yes | 4.5 (1.93–10.48) | 0.68 (0.18–2.63) |
| No | | I |
| Age (years) | | |
| <55 | 1.74 (0.38–7.93) | 3.36 (0.56–20.05) |
| ≥55 | | I |
| Duration of Wound | | |
| Management (minutes) | | |
| <14 | 0.392 (0.149–1.035) | 1.183 (0.35–3.99) |
| ≥14 | | I |

Note: **Significant variables from multivariate analysis.

Abbreviations: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval.

severity score after analgesia intake was mild.³³ Analgesics such as paracetamol, NSAIDs (diclofenac), and opioids reduce the severity of pain during wound management.³⁴ In addition, administration of analgesics before starting wound care procedures had reduced the severity of pain during WCP.³¹ Furthermore, for patients with wounds who experienced severe pain, non-steroidal anti-inflammatory drugs and opioids were given during dressing change and it was found to be effective in reducing pain severity during wound management.¹⁷ However, a study done in Californiashowed that no difference in severity of pain was reported when NSAIDs were used during wound management with a *P*-value>0.05 3. This variation from our result might possibly be because of differences in the group of drugs.

In the current study, patients with an acute wound had higher odds of moderate-to-severe WRP during wound management than patients having a chronic wound. In agreement with our finding, a study done at University of Hull, UK in 2009 showed that acute wounds, such as incision wounds following surgery, burn injuries, and traumatic wounds were extremely painful during wound care procedures.² In addition, an acute wounds that were found in patients with surgical and traumatic wounds had experienced moderate-to-severe WRP during wound management, this might possibly have been due to a consequence of one or all of these mechanisms including nociceptive, inflammatory, neuropathic, and ischemia that encourages anaerobic metabolism, lowering pH, and elevating lactate levels in the wound, which sensitize nociceptors.⁷ In another study, a similar number of patients with acute and chronic wounds had reported moderate-to-severe pain during wound care procedures (79.9% and 79.7%, respectively).²⁹ Contrary to the current study, patients with chronic wounds reported a higher intensity of pain during wound care procedures than patients with acute wounds.³⁵ A possible reason for this may be the small number of patients who had chronic wounds in the current study.

In this study, anxiety was another major determinant factor for the experiencing of moderate-to-severe WRP during wound management, and the result of our study is in agreement with various studies. Pain during wound management is often triggered by tissue injury or trauma, it may be also modulated by emotional reactions (anxiety).³⁶ Another study also showed that the presence of anxiety before wound management was significantly associated with the severity of pain during wound management.³⁷ Patients who have anxiety had expected more pain and when the wound was manipulated to provide wound management, expectations of increased pain powerfully enhanced the subjective experience of pain.⁵ A possible reason for this might be because anxiety leads to anticipation of pain, which promotes an overestimation of pain intensity or increases pain perception.^{4,38}

Limitation of the Study

This study did not explore the knowledge and attitudes of wound care providers towards the assessment of severity of wound-related pain, risk factors for wound-related pain, and its management.

Conclusion

The prevalence of moderate-to-severe WRP during wound management was considerably high. Anxiety, the presence of baseline wound pain, acute wound, and analgesia intake were independent risk factors for the severity of WRP during wound management. Therefore, we recommend that wound care providers should assess baseline wound pain, degree of WRP, and manage accordingly. Additionally, more emphasis should be given to patients with baseline wound pain, anxiety, and acute wounds. Furthermore, we recommend further similar studies incorporate the knowledge and attitudes of wound care providers towards pain control during wound care procedures.

Abbreviations

AOR, adjusted odds ratio; COR, crude odds ratio; VRS, verbal rating scale; NSAID, non-steroidal anti-inflammatory drugs; PHQ, personal health questionnaire; SPSS, statistical package of social sciences; STAI, state-trait anxiety inventory; UOGCSH, University of Gondar Comprehensive Specialized Hospital; WRP, wound-related pain.

Data Sharing Statement

Data and materials used in this study are available and can be presented by the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the ethical review committee of college of medicine and health sciences, University of Gondar. Signed informed consent was obtained from each participant after detailed disclosure and in accordance with the Declaration of Helsinki.

Consent for Publication

Not applicable: the article did not include any personal or any clinical detail of any participant.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that they have no conflict of interests.

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