

Translation, Cultural Adaptation and Validation of the Medication Adherence Report Scale (MARS-5) in Nepalese Cancer Patients Experiencing Pain

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Background: Adherence to pain medication is crucial for cancer patients, since non-adherence can lead to increased suffering, reduced quality of life and increased healthcare costs. Although the five-item Medication Adherence Report Scale (MARS-5) is a validated tool for assessing medication adherence, but it has not been translated and validated into the Nepalese language. This study aimed to translate, culturally adapt and validate the MARS-5 in Nepalese language for Nepalese cancer patients who were experiencing pain.

Materials and Methods: The cross-sectional validation study utilized a convenience sampling method. Initially, a pre-test was conducted with 25 patients. The MARS-5 was then forward and backward translated following the EORTC QLG translation procedure. The final translated version was reviewed by experts and subjected to a second pre-test. Construct validity was assessed through principal component analysis, and internal consistency was measured using Cronbach's alpha coefficient. Inter-rater reliability was evaluated using the Intra-Class Correlation coefficient (ICC).

Results: The study included 204 cancer patients (ages 18–86, 55% female). The Nepalese version of the MARS-5 was translated without significant issues and underwent pre-testing with participants. Participants discussed the scale during these pre-tests, providing feedback on its clarity and comprehensibility. While formal assessment tools were not employed, the iterative nature of the pre-testing process allowed for the refinement of the translation based on participant feedback, indicating a robust understanding of the scale among participants. The ICC of test-retest reliability was found to be 0.860. The Kaiser Meyer Olkin's value was 0.690, and Cronbach's alpha was 0.72, indicating good construct validity and high internal consistency. The medication non-adherence rate was 11.3%.

Conclusion: The MARS-5 was successfully translated, culturally adapted, and validated in Nepalese for use among Nepalese cancer patients experiencing pain. The Nepalese version of MARS-5 is a reliable tool for evaluating medication adherence in this population.

Keywords: cancer pain, cultural adaptation, MARS-5, medication adherence, Nepalese patients, validation

Introduction

Pain is a common, debilitating, distressing symptom in cancer patients.^{1–3} It has been reported that more than half of patients with advanced cancer experience moderate or severe pain, with one-third not receiving adequate treatment.³ Pain can significantly impact patients' quality of life (QoL) by affecting their physical, psychological, and social functioning. Therefore, pain management is essential to cancer care.^{4–7} Patient adherence to their pain medication plays a crucial role in determining the effectiveness of pain relief, even with an optimal pain management plan available. The concept of adherence pertains to the degree to which individuals follow agreed recommendations for taking prescribed medications.⁸ Adherence is influenced by factors that should be considered,^{9,10} which is key to achieving optimal clinical outcomes. Therefore, its evaluation is crucial for both scientific and clinical communities. Concerning pain management, adhering

consistently and correctly is critical in attaining optimal pain relief and enhancing patients' overall well-being. Many studies have shown that non-adherence to long-term treatment plans is a significant factor affecting treatment outcomes in cancer patients and is a prevalent issue when managing cancer-related pain in clinical settings.^{11,12} Maintaining adherence may pose challenges when analgesics are given on an as-needed basis since patients might experience uncertainty about appropriate timing or display reluctance due to concerns about potential side effects or addiction risks.^{11,12} Individuals may be hesitant about prolonged usage or exceeding instructed doses, affecting their adherence behavior.^{11,12}

Consequently, close collaboration between healthcare providers and patients is essential to formulate tailored pain management strategies that account for individual needs and preferences while effectively emphasizing the significance of strict compliance towards maximizing pain control outcomes.^{11,12} A recent study⁹ reported that the fear of addiction and its physiological and harmful effects relates to several factors, including using pain medication and fear of tolerance and pain. It is hoped that investigation in the area can facilitate improvement in medication adherence and the development of tools for measuring pain in cancer settings.

The advantages and disadvantages of self-administered adherence measures¹³ were assessed to allow the development of a tool that is easy to use and not burdensome to patients and investigators. The MARS-5, a five-item self-administered questionnaire,¹⁴ is a shorter form of The Medication Adherence Report Scale-10 (MARS-10, ©Professor Rob Horne)^{15–17} which assesses both intentional and unintentional non-adherence. By normalizing non-adherence, the MARS-5 overcomes some limitations common to self-report measures, such as social desirability bias.

Moreover, the MARS-5 is a generic tool that can be used regardless of the disease or the prescribed drug.¹⁵ It has been validated in many clinical settings,^{17–19} and used to assess adherence in clinical studies worldwide.^{20–24} Although it was initially developed in English,¹⁵ it has since been translated into several other languages, including Arabic,²⁵ Italian,¹⁸ German,²⁶ Hungarian,²⁷ Portuguese²⁸ and Swedish.²⁰

Obtaining access to pain medications can be a substantial challenge in low-resource environments. Effective pain management enhances cancer patients' overall treatment experience and quality of life. Notably, Nepalese is the primary language, widely spoken, read, and written by most of the population. Therefore, having a tool available in the Nepalese language is crucial to ensure accessibility and comprehensibility. This adaptation is poised to address specific healthcare challenges unique to Nepal and promises to enhance medication adherence and pain management for Nepalese cancer patients.

In light of these considerations, our study aims to translate and validate the MARS-5 tool in Nepalese language to determine its suitability for assessing medication adherence in Nepalese cancer patients experiencing pain. This endeavor addresses a critical gap in available assessment tools and potentially improves healthcare outcomes and quality of life for a diverse patient population.

Materials and Methods

Study Design

This validation study encompasses translation, cultural adaptation and psychometric evaluation. The process adhered to the established forward-backwards translation method and was refined following an expert consultation. In this cross-sectional study, we aimed to assess the psychometric properties of the developed tool in a subset of a Nepalese-speaking cancer patient population experiencing pain. The study (translation) was conducted as part of the Clinical pharmacists' intervention in pain management in cancer patients (PharmaCAP) trial.^{13,29}

Study Setting and Site

The study was conducted in two major hospitals in Kathmandu Valley, Nepal, located in the Kathmandu and Bhaktapur districts.

Participants

The study participants were adults fluent in the Nepalese language, had a confirmed medical diagnosis of cancer diagnosed by the medical oncologists and were experiencing some degree of pain. Cancer pain could be acute or chronic, caused by either cancer or cancer-related treatments, and be of any duration and severity. The participants could have any type and stage of

cancer. The following patients were excluded: Patients who had 1) undergone surgery for current pain, 2) a recent history of trauma, and 3) diagnosed with a psychiatric illness as confirmed by trained mental health professionals.

Ethical Considerations

The study was approved by the Ethical Review Board (ie, Nepal Health Research Council) in Nepal (Ref No 497/2021) and Monash University Human Research Ethics Committee (MUHREC) (Project ID: 30907). Rob Horne, the developer of MARS-5, granted permission to translate, culturally adapt and validate MARS-5 in the Nepalese language. The hospital and ethical approvals from both study sites were also taken, while administrative permission for data collection was obtained from the hospital management. Written informed consent was obtained from patients following a verbal explanation of the study. All procedures complied with the Declaration of Helsinki.

Data Collection Procedure

The data collection procedure involved the clinical oncology team, led by the principal investigator (PI), identifying eligible cancer patients between October 2021 and April 2022. Eligible patients were then approached, and informed consent was obtained before data collection. The procedure ensured that participants understood the voluntary nature of their participation and the confidentiality of their information. Data collection included administering questionnaires, with assistance provided to illiterate participants as needed. A study investigator distributed the data collection forms, demographic questionnaires and the Nepalese version of the MARS-5 at each study site. The participants were allowed sufficient time to complete the questionnaire independently. Additional time was granted to these participants if required to complete the questionnaire. After obtaining the written informed consent, the PI and research assistant collected the data from the validation study participants using the Nepalese version of the MARS-5 questionnaire. Information regarding the participants' demographic characteristics, type of cancer, duration of pain since cancer diagnosis, presence of other comorbidities, and details regarding previous and current treatment interventions were also collected from the medical records.

MARS-5 Questionnaire

The MARS-5 consists of five items describing non-adherent behaviors (eg “I forget to take the medicine / I alter the dose of medicine): patients were asked to evaluate on how often they adopt each behaviour with a 5-point scale, ranging from “always” to “never” (1–5 points).^{15,26} The total score on the questionnaire ranged from 5 to 25, with higher scores indicating better adherence.²⁶ In this study, adherence was defined as achieving a score of 20 or higher on the aggregated MARS-5 scores, based on previous research suggesting this as representing >80% adherence.³⁰ The original English version of the scale shows good reliability (Cronbach's α 0.69–0.90).¹⁴

Translation Procedure and Pilot Testing of the MARS-5 Nepalese Version

The English version of the MARS-5 tool was translated into the Nepalese language. The translation process followed translation procedures by the European Organisation for Research and Treatment of Cancer (EORTC).³¹ The process was carried out in five stages:

1. **Forward translation:** Two native Nepalese speakers translated the English version of the MARS-5 into Nepalese. Subsequently, the translation coordinator (TC) compared and merged the two translations into a single reconciled version.
2. **Backward translation:** Two independent translators translated the reconciled Nepalese translation back into English. The back translators could not see the original English version to reduce bias.
3. **Review and interim version:** The TC formed an expert committee of clinical pharmacists, academicians in pharmacy and medical oncologists to review the reconciled back translation and the original English version. The expert committee made any necessary changes to the reconciled back translation and created an interim version for pilot testing.

4. **Pilot testing:** The interim version was tested on 25 cancer patients experiencing pain. The pilot testing ensured the translation was understandable, acceptable, and culturally appropriate. Patients were asked to provide feedback on the questions' clarity and wording, and any misunderstandings, ambiguities, or inappropriate wording were recorded for further correction.
5. **Final version:** The final version of the Nepalese MARS-5 was created by incorporating patient feedback during the pilot testing. The expert committee then reviewed the final version for any typographical, grammatical, or semantic errors. The final version was then deemed as ready for the validity study. The detailed translation process is shown in [Figure 1](#).

MARS-5 Validation and Reliability Analysis

Face Validity

The face validity of the tool was conducted among 25 patients in the initial pilot study. A self-administered interim version of MARS-5 Nepalese was administered to cancer patients experiencing pain. The patients were asked to respond to the questionnaires and comment on the tool's clarity and suitability to measure medication adherence. Additionally, the patients were requested to suggest an appropriate and straightforward way to ask questions. The patients' suggestions and comments were considered for finalizing the tool.

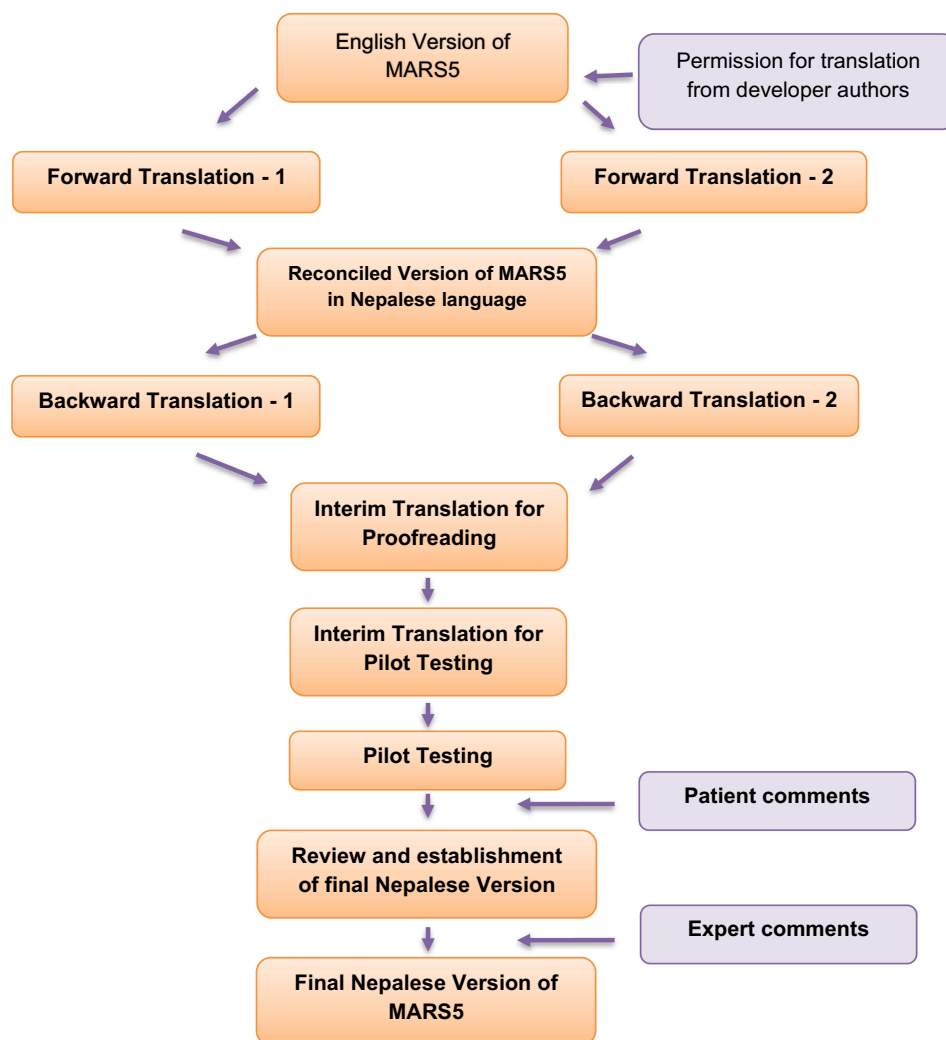


Figure 1 Flowchart of stepwise translation procedure.

Content Validity

The MARS-5 has been evaluated for content validity in its original language (ie, English).¹⁴ Therefore, content validation was not performed.

Sampling Method and Sample Size Calculation

The convenience sampling method was chosen for its ease and cost-effectiveness in recruiting cancer patients with pain from private and public hospitals in Nepal. This method selects participants based on their accessibility to the researcher, potentially introducing bias. The sample size for the study was determined by utilizing the item-response theory,³² resulting in a ratio of 1:40.8 (number of participants per item). Previous studies have proposed varying sample size estimates with a ratio of items to participants ranging from 1:5 to 1:10.^{33,34}

Statistical Analysis

The data were manually entered into Microsoft Excel 365 and cleaned and analyzed using the Statistical Package for Social Sciences (SPSS), IBM, Armonk, NY, IBM Corp (Version 28.0). The socio-demographic variables, including age, gender, ethnicity, education and occupation, were reported using descriptive statistics. The clinical characteristics variables, including diagnosis, staging, metastasis, Karnofsky Performance Scale, were reported using descriptive statistics. Pain intensity was assessed using the Numeric Rating Scale (NRS).³⁵ Pain distribution was reported as the frequency count and percentage of the body part affected, while pain duration (in months) was reported as mean and standard deviation. Analgesic's classes administered to patients in pain were reported using descriptive statistics.

Sampling Adequacy and Sphericity

Before exploring its appropriateness for factor analysis, sampling adequacy was analyzed using the Kaiser-Meyer-Olkin (KMO). A KMO value of more than 0.5 was deemed acceptable. A Bartlett's test of sphericity was conducted to determine common factors and to specify the appropriateness of the factor analysis model.³⁶

Reliability and Internal Consistency Measurement

Inter-Rater Reliability

Inter-rater reliability among healthcare providers assisting Nepalese cancer patients in completing the MARS-5 was assessed using the Intraclass Correlation Coefficient (ICC). ICC values below 0.50 indicate poor reliability, 0.50 to 0.75 indicate moderate reliability, and above 0.75 indicate good reliability.³⁷ Confidence intervals (95% CI) were used to indicate the precision of the ICC estimate.

Internal Consistency

Cronbach's alpha (α) coefficient was used to measure the internal consistency and reliability of the questionnaire dimensions. A coefficient value greater than 0.70 tends to indicate a high level of internal consistency, while α values ≥ 0.7 were deemed satisfactory.³⁸

Results

Translation and Pre-Test

Responses from twenty-five participants were collected from those who completed the pre-test version of the questionnaire within 5–10 minutes. Most participants clearly understood the questionnaire without encountering any significant issues. There were no cultural aspects that needed any revision. Participants who participated in the pre-test were not included in the subsequent validation study to prevent biases. A copy of the translated version is available to readers upon request.

Patient Characteristics

Socio-Demographic and Clinical Characteristics of Cancer Patients

The data were collected from 204 cancer patients who completed the MARS-5 Nepalese translated questionnaire. Table 1 shows the socio-demographic characteristics of cancer patients. The participants' ages ranged from 18 to 86 years. Approximately 54.9% of the participants were females, with the majority (45.1%) having secondary-level education. In our study, 35.3% of the patients were illiterate, requiring assistance to complete the MARS-5. Trained healthcare professionals provided standardized support to ensure accurate reporting.

Table 2 shows the clinical characteristics of cancer patients. The most common diagnoses were malignant brain and central nervous system tumors (16.2%), lip and oral cavity cancers (15.7%) and colon and rectum cancer (14.7%), and

Table 1 Sociodemographic Characteristics of Cancer Patients

Sociodemographic characteristics	Frequency	Percent (%)
Public hospital	99	48.5
Private hospital	105	51.5
Age Mean± SD: 53.3± 15.9		
Gender		
Male	91	44.6
Female	112	54.9
Others	1	0.5
Religion		
Hinduism	146	71.6
Buddhism	36	17.6
Christianity	10	4.9
Islamic	9	4.4
Others ^a	3	1.5
Ethnicity		
Brahmin / Chhetri	89	43.6
Janjaati	92	45.1
Madeshi	8	3.9
Muslim	5	2.5
Other Ethnic Groups ^b	10	4.9
Education		
Illiterate	72	35.3
Up to secondary level (grades 1–10)	94	46.1
Intermediate / Diploma	27	13.2
Bachelors' Degree	10	4.9
Master's Level or higher	1	0.5

(Continued)

Table 1 (Continued).

Sociodemographic characteristics	Frequency	Percent (%)
Marital Status		
Single	13	6.4
Married	179	87.7
Widowed or divorced	12	5.9
Family type		
Nuclear	143	70.1
Joint / Extended	61	29.9
Health Insurance		
Private	15	7.4
Government	79	38.7
None	110	53.9

Notes: SD Standard Deviation ^aKirat ^bOther ethnicities include Dalits, Kamis, etc.

Table 2 Clinical Characteristics of Cancer Patients

Clinical Characteristics		
Cancer type		
Gynecological Cancer	43	21.1
Head and Neck Cancer	48	23.5
Digestive System Cancer	36	17.6
Liver Cancer	2	1.0
Lymphomas	6	2.9
Respiratory System Cancer	24	11.8
Endocrine System Cancer	10	4.9
Central Nervous System Cancer	33	16.2
Prostate Cancer	1	0.5
Pancreatic Cancer	1	0.5
Metastasis		
Yes	41	20.1
No	163	79.9
Metastasis Site		
Adrenal	3	1.5
Bone	13	6.4
Brain	8	3.9

(Continued)

Table 2 (Continued).

Clinical Characteristics		
Brain, Bone	1	0.5
Liver	9	4.4
Lungs	3	1.5
Multiple skeletal	3	1.5
Pancreatitis	2	1.0
Stomach	1	0.5
Karnofsky Performance Scale		
50	10	4.9
60	19	9.3
70	97	47.5
80	71	34.8
90	7	3.4
Pain Duration (months)		
≤ 3	89	43.6
> 3	115	56.4
Type of pain^a		
Nociceptive	94	46.1
Deep Somatic	32	15.7
Superficial Somatic	47	23.0
Visceral	15	7.4
Neuropathic	60	29.4
Peripheral Neuropathic	56	27.5
Central Neuropathic	4	2.0
Mixed (Nociceptive and Neuropathic)	50	24.5

Notes: ^aDiagnosis made by medical oncologists.

the majority reported experiencing pain for more than three months (56.4%); primarily nociceptive pain (46.1%). The mean \pm SD of pain intensity assessed by the NRS was 4.68 ± 2.037 .

Table 3 shows analgesic's class administered to cancer patients experiencing pain.

Descriptive Statistics for MARS-5

The medication non-adherence rate was 11.3% based on scores of below 20 on the MARS-5. Table 4 presents the descriptive statistics of the MARS-5 Nepalese version, including missing values, mean score, standard deviation (SD), minimum, maximum, skewness and kurtosis. The version of MARS-5 consists of five items assessing all participants' medication adherence. The questionnaire items inquire about how often patients i) forget to take their medications, ii) alter the dose, iii) stop taking their medication for a while, iv) take less than instructed, or v) take more than instructed.

Table 3 Analgesic's Class Administered to Patients in Pain

Category	Drug	ATC Code	Frequency	Percentage
NSAIDs	Aceclofenac 100 mg	M01AB15	25	17.36
	Etoricoxib 90 mg	M01AH05	18	12.50
	Ibuprofen and paracetamol 1 tab	M01AE51	27	18.75
	Ketorolac 30mg SOS IM	M01AB15	11	7.64
	Diclofenac	M01AB05	3	2.08
	Nimesulide 1tab BD	M01AX17	4	2.78
Weak Opioids	Tramadol + Acetaminophen	N02AJ13	26	18.06
	Tramadol 1tab TID	N02AX02	16	11.11
Strong Opioids	Morphine	N02AB02	12	8.33
	Pethidine 50mg IV	N02AA01	2	1.39

Table 4 Descriptive Statistics of MARS5 Nepalese Version Scores (N = 204)

Items	Missing values	Mean±SD	Minimum	Maximum	Skewness	Kurtosis
MARS5 - 1 I forget to take them	0	4.06±1.03	1	5	-0.808	-0.230
MARS5 - 2 I alter the dose	0	4.79±0.61	1	5	-3.763	16.624
MARS5 - 3 I stop taking them for a while	0	4.48±0.94	1	5	-1.898	3.050
MARS5 - 4 I stop taking them for a while	0	4.73±0.71	1	5	-3.204	10.774
MARS5 - 5 I take less than instructed	0	4.70±0.60	31	5	-2.520	8.696

Abbreviation: SD: Standard Deviation.

The skewness and kurtosis values for the MARS-5 Nepalese version scores were negative, indicating that the distributions are slightly left-skewed and platykurtic. The findings suggest that more participants had lower scores, more widely distributed than normal distributions, indicating moderate non-adherence to the medication regimens.

Sampling Adequacy and Sphericity

The KMO Measure of Sampling Adequacy value was 0.690, deemed acceptable for factor analysis. Furthermore, the Bartlett test of homogeneity of variances (sphericity) was significant ($p < 0.05$), indicating that the variables were correlated, which is a necessary condition for factor analysis ([Table S1](#)).

Reliability and Internal Consistency

Intraclass correlation coefficients showed a substantial agreement among raters for both single measures (ICC = 0.672, 95% CI [0.471, 0.825], $p < 0.001$) and average measures (ICC = 0.860, 95% CI [0.728, 0.934], $p < 0.001$), indicating robust inter-rater reliability of the translated and culturally adapted MARS-5 tool in assessing medication adherence among Nepalese cancer patients experiencing pain. [Table 5](#) shows the reliability and internal consistency of the translated Nepalese version of MARS-5, where good reliability was seen (Cronbach's $\alpha = 0.724$). The coefficient value was greater than 0.70, indicating a high level of internal consistency.

Table 5 Reliability Analysis of Nepalese Version of MARS5 Questionnaires (n =204)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
MARS5 - 1	18.69	3.870	0.660	0.496	0.596	0.724
MARS5 - 2	17.97	5.718	0.520	0.295	0.674	
MARS5 - 3	18.28	4.734	0.484	0.309	0.682	
MARS5 - 4	18.02	5.738	0.397	0.206	0.708	
MARS5 - 5	18.06	5.987	0.431	0.306	0.700	

Notes: MARS5 - 1 I forget to take them; MARS5 - 2 I alter the dose; MARS5 - 3 I stop taking them for a while; MARS5 - 4 I stop taking them for a while; MARS5 - 5 I stop taking them for a while.

R-Matrix (ie, the Correlation Matrix)

The R-matrix (ie, the correlation matrix)— shows the strength and direction of the linear relationship between each pair of items within the MARS. The top half of the table contains the correlation coefficients between all pairs of items in the MARS5 scale, while the bottom half contains the one-tailed p-values of the correlations ([Table S2](#)). Variables with very few correlations above 0.3 might not fit with the pool of items, and variables with correlations greater than 0.9 might be collinear. The correlation matrix shows acceptable correlation values, with the five items being strongly correlated. The strongest correlation is between MARS5-1 and MARS5-5, with a coefficient of 0.540. The other four correlations are also strong, with correlation coefficients ranging from 0.419 to 0.515. The correlations are statistically significant at the 1% level. The correlation matrix shows that the five variables measure similar constructs or are affected by the same underlying factors.

Ceiling and Floor Effects

The results indicated that only 72 patients (35.3%) scored the maximum possible score of 25 in MARS-5, and no patients scored the least possible score, ie 5.

Discussion

Our study provided robust evidence to support the validity and reliability of the translated Nepalese version of the MARS-5 in assessing self-reported medication adherence among Nepalese-speaking cancer patients experiencing pain. A comprehensive validation process on a substantial sample size (n=204) demonstrated that the translated scale effectively measures the intended outcomes with minimal error or bias. Efforts were made to enhance representativeness by including participants from multiple healthcare facilities (private and public hospitals from Nepal), considering various cancer types and stages, and confirming demographic diversity. These measures help to increase the generalizability of the findings to a broader population of Nepalese-speaking cancer patients with pain.

A significant proportion of our study population was illiterate, necessitating assistance to complete the MARS-5. This assistance, although standardized, may have introduced minor biases in the responses. The verbal explanations provided could have influenced how questions were understood and answered. Despite these potential biases, the overall medication adherence trends were consistent across both literate and illiterate groups. The cultural adaptation of the MARS-5 aimed to ensure comprehension across all literacy levels, contributing to the reliability of the results.

The R-matrix analysis shows robust correlations between the five items comprising the MARS-5 scale. All correlations were statistically significant at the 1% level, demonstrating that the five variables capture analogous concepts or are influenced by shared underlying factors. These observations are aligned with the theoretical framework of the MARS5 scale, which proposes that the five items assess similar facets of medication adherence. The substantial correlations observed among the MARS-5 scale items indicate internal consistency. This suggests that the scale's items evaluate the same underlying construct rather than different constructs, as supported by an acceptable Cronbach's alpha value (Cronbach's $\alpha = 0.72$). The scale effectively captures the intended construct and exhibits consistent measurement of medication adherence.

Medication adherence is essential for effective pain management in cancer patients. This study reports a medication non-adherence rate of 11.3%, which emphasizes the complexity of adherence issues. It's essential to acknowledge that adherence cannot be generalized uniformly across all patients or cancer types. Therefore, the use of MARS-5 or similar standardized tools should be encouraged in research on medication adherence in cancer patients. MARS provides a valuable advantage by offering a standardized and validated measure of medication adherence, which can enhance the comparability of adherence rates across different studies and populations. By adopting MARS, researchers can contribute to a more consistent understanding of adherence behaviors in cancer patients, facilitating meaningful comparisons and allowing for more precise interventions.

Moreover, the wide range of adherence rates observed in the systematic review of 18 studies, ranging from 8.9% to 82.0%, underscoring the complexity of medication adherence in cancer patients.⁹ Therefore, future research should explore factors contributing to variability and investigate how interventions can be tailored to address these factors effectively.

By adopting standardized tools and providing clear definitions of non-adherence, future studies can contribute to a more robust body of evidence on this critical aspect of cancer care, ultimately improving patient outcomes.

Study Strengths and Limitations

The MARS-5 tool was successfully validated in this study for use in Nepal and among Nepalese-speaking populations, following the recommended guidelines for translation, cultural adaptation and validation. The analysis was robust due to its multicenter design, large sample size, representative sample and minimal missing data. The multicenter design increased the study's sample size and statistical power, making the findings more reliable. Second, it helped reduce bias and improve the generalizability of the results. Collaboration among diverse institutions also fostered interdisciplinary cooperation and a comprehensive analysis of the research question. Ultimately, this design strengthened the validity and applicability of the study by ensuring diverse participant representation and comprehensive analysis.

Nevertheless, our study had some limitations. The use of convenience sampling may not have fully represent all the cancer patients experiencing pain in Nepal, as this method relies on the accessibility and willingness of participants, potentially introducing sampling bias and limiting the generalizability of our findings. Additionally, the reliance on self-reported data for medication adherence could be influenced by recall and social desirability biases. Importantly, excluding patients who have undergone surgery further limits the generalizability of our results, as their experiences and adherence behaviors might differ significantly from those who have not had surgery. These factors should be considered when interpreting the study's outcomes and applying them to the broader population. Another limitation of this study is the high proportion of illiterate participants (35.3%) who required assistance to complete the MARS-5. While helpers were trained to provide standardized support, the possibility of introducing bias cannot be entirely ruled out. Future research should explore alternative methods, such as audio recordings or more robust assistant training protocols, to minimize potential biases. Finally, the study did not use concurrent or predictive validity to assess the health instruments.

Regarding the classification of "non-adherence" on the MARS-5, it is essential to clarify that the MARS considers adherence behavior on a continuum rather than a binary scale. It captures a range of adherence behaviors, from excellent to complete non-adherence, and provides a more nuanced understanding of patient adherence patterns. This study defined non-adherence as a score falling below a predefined threshold on the MARS-5, the standard approach in literature. However, it is impossible to determine whether the level of non-adherence would impact the clinical outcomes.

Despite these limitations, the findings of this study have significant implications for both research and treatment. Nepalese is the primary language used in clinical consultations and among the general population in Nepal. It is also spoken in several other countries, including Bhutan, Myanmar, Brunei and India. The availability of a validated Nepalese version of the MARS-5 tool can facilitate its use in clinical practice and research, enabling healthcare providers to assess medication adherence among cancer patients more effectively.

The successful adaptation of the MARS-5, even with a high proportion of illiterate participants, demonstrates its reliability and applicability. The standardized assistance provided to illiterate patients ensured accurate reporting, although potential biases were acknowledged and analyzed. Comparative analysis showed consistent adherence trends between literate and illiterate groups, indicating the robustness of the adapted tool.

Additionally, this study sets a methodological precedent for the translation, validation and cultural adaptation of the MARS-5 and other clinical assessment tools from English to non-English languages and diverse cultural settings. Future research should focus on developing and validating methods to minimize potential biases associated with illiteracy, such as using audio recordings or visual aids. This will ensure accurate data collection across all literacy levels, contributing to more inclusive healthcare practices and adherence research.

Conclusion

The Nepalese version of the MARS-5 is reliable and valid and can be used to assess medication adherence in various settings, including hospitals, clinics and community health centers. The MARS-5 can also identify at-risk patients for poor medication adherence to receive targeted interventions. The Nepalese version of the MARS-5 will be a valuable tool for improving medication adherence among cancer patients experiencing pain. It can be used to evaluate and develop interventions, identify patients at risk and enable evaluation of the effectiveness of these interventions.

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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.

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Disclosure

Professor Rob Horne is the originator and copyright holder of the MARS-5 questionnaire. The authors declare no other conflict of interest.

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