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Original Research Article

Establishing convergent validity of a medication literacy assessment instrument for use within the Nigerian setting

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Abstract

Purpose: *To establish convergent validity of a previously designed medication literacy instrument for use in Nigeria.*
Methods: *A cross-sectional study was conducted in Zaria, Kaduna State from May to August 2021, with structured instruments administered to conveniently sampled members of the public via one-on-one interviews to collect data. These instruments included a previously designed medication literacy assessment instrument and the Newest Vital Sign United Kingdom version (NVS-UK) health literacy assessment questionnaire. Data obtained was reported using descriptive and inferential statistics.*
Results: *Three hundred respondents were interviewed, majority of whom were females (51 %) and aged between 15 – 25 (76.6 %). The percentage of correct responses to the NVS-UK questions ranged from 22 to 58.3 %, while the total number of NVS-UK questions answered correctly by respondents ranged from 0 to 6 with a mean of 2.2 ± 1.7. Respondents' NVS-UK scores were associated with their highest level of education completed (p = 0.001). The NVS-UK showed adequate internal consistency (Cronbach's Alpha = 0.7) and validation of the developed medication literacy instrument against the NVS-UK demonstrated a Spearman's rho correlation coefficient of 0.42.*
Conclusion: *The designed instrument is valid and can be used to assess medication literacy within the country.*

Keywords: *Health literacy, Medication literacy, Newest vital sign, Nigeria, Validation study*

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INTRODUCTION

Over the years, there has been increasing interest in the concept of health literacy, and greater awareness of its relationship to many health outcomes. For individuals, this type of literacy may be defined as "the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others" [1]. Good health literacy is essential for patients to be able to take control and manage their health. Benefits of being health literate include greater patient safety, fewer hospitalizations, better self-care abilities, and

greater cost savings for individuals and healthcare systems [2].

Medication literacy on the other hand is a sub-type of health literacy. It is defined as the degree to which individuals can obtain, comprehend, communicate, calculate and process patient-specific information about their medications, and make informed decisions in order to safely and effectively use their medications [3]. Individuals require adequate levels of medication literacy to properly use their medicines because many tasks associated with the proper use of medications are complex [3]. Furthermore, there is also now evidence directly linking medication literacy with optimal medication adherence [4].

Assessing medication literacy competencies is an important step in identifying patient-specific inabilities and needs. These assessments can help to improve patient self-care skills and promote safe and appropriate use of medications [5]. For many years, several studies that aimed to describe medication literacy in patients used general health literacy measurement instruments for their assessments [5]. However, there were (and still are) valid concerns that many of these instruments did not specifically assess skills related to medication use. This led to the development of several medication literacy specific assessment tools in recent years [5-6]. Most of these tools were however developed for specific populations in various countries, and there is currently no standard instrument for medication literacy assessment worldwide.

Not much is known about the health and/medication literacy status of Nigerians. Available studies on health literacy within the country [7-8] used only one type of health literacy assessment instrument (the Brief Health Literacy Screening tool-BHLS) and reported conflicting results. It should also be noted that the BHLS tool is a screening tool that does not assess any of the known health/medication literacy domains.

To aid in the measurement of medication literacy levels within the Nigerian setting, an earlier result of the design from preliminary validation of an instrument to measure medication literacy was reported [9]. Thus, this follow-up study aimed to assess some psychometric properties of the Newest Vital Sign (NVS) health literacy screening tool, which had not been previously used within the Nigerian setting before. The study also investigated construct (i.e., convergent) validity of previously designed medication literacy assessment instrument by comparing total scores on this instrument with those on the NVS. This comparison was based on the hypothesis that since this instrument assesses at least three well-known health/medication literacy skill domains (numeracy, document literacy, and prose literacy), there should be some correlation between scores on this instrument and any other validated health literacy assessment instrument (like the NVS) assessing these same domains.

METHODS

Study design

The study was cross-sectional and utilized structured instruments administered via one-on-one interviews to collect data from May 2021 to August 2021.

Study population, inclusion criteria, and sample size estimation

The study population included members of the public residing, schooling, or working in Samaru-a suburb located in Zaria, Kaduna State - who agreed to participate, were aged at least 15 years, could read and speak English Language, and were not health care professionals or students of health-related courses. Individuals who did not fulfill all these criteria were excluded. A sample size of 300 was also selected for the study based on recommendations of best practices for developing and validating questionnaires as outlined in a review paper by Boateng *et al* [10].

Study instruments

Two instruments and a data collection form were used for data collection during this study. The data collection form contained five items, and collected data about the demographic characteristics of respondents including gender, age, highest educational qualification completed etc.

One of the other two instruments was the United Kingdom validated version of the Newest Vital Sign (NVS-UK) test to assess health literacy [11]. The NVS initially designed by Weiss *et al* [12] is one of the most popular health literacy screening tools currently available. It is easy to administer and can quickly evaluate a patient's health literacy skills. The NVS test utilizes a specially designed ice cream nutrition label, which respondents are asked to study before they are asked a series of 6 - 7 open-ended questions depending on what version is used. The questions accompanying the label assess prose and document literacy, in addition to numeracy skills.

The last instrument was a previously validated tool designed to measure medication literacy in members of the Nigerian public [9]. It contains ten (10) open ended questions centered around the drug label for a hypothetical antibiotic drug named NABILOL. The questions accompanying the label assess respondents' knowledge of drug indication, ability to calculate dose(s) and medication timing etc.

Data collection

Respondents were randomly selected and approached at various times in different locations including hostels, markets, classrooms and churches. The aim of the study was briefly described, and the entire process to be undertaken explained to them. Written consent was then sought for from those who were willing to participate.

Both labels (the ice-cream one for the NVS, and hypothetical antibiotic for the medication literacy tool) were printed out on A4 sheets of paper and distributed to respondents consecutively. Respondents were allowed to study them for as long as they wanted before they were interviewed by the researcher. Their responses were written down verbatim, and all the interviews were conducted by the same researcher. On average, the data collection process took about 15 minutes per respondent for both instruments.

Ethical considerations

Ethics approval was sought and obtained from the Committee for the Use of Human Subjects for Research of Ahmadu Bello University, Zaria, Nigeria before the commencement of the study (approval no: ABUCUHSR/2021/UG/013). All participants were informed about the aim of the study before written consent was obtained and told that participation was voluntary. The study was also anonymous and did not collect any data that could be used to identify respondents.

Data analysis

Data collected were coded and entered into a Microsoft Excel 2016 spreadsheet and analyzed using the Statistical Package for the Social Sciences (SPSS) software version 22. All correct answers to the NVS-UK and medication literacy assessment questions were given a score of 1 while wrong answers, and "I don't know" responses were scored 0. Total NVS and medication literacy scores were computed by totaling respondents scores on the first 6 questions of the NVS-UK and the 10 questions on the medication literacy instrument.

Some of the data obtained was reported using descriptive statistics (frequencies and percentages), while inferential statistics were used for the other analyses. Reliability for both instruments were computed by calculating Cronbach's alpha. To explore associations between respondent characteristics (Gender, age & educational level) and their overall NVS-UK scores, non-parametric tests (Mann Whitney U and Kruskal-Wallis tests) were used.

To determine the construct validity of the medication literacy instrument, Spearman's rho coefficient of correlation was computed between scores on the medication literacy instrument and the NVS-UK. Statistical significance for all analyses were set at $p < 0.05$.

RESULTS

Data reported was collected from 300 respondents from May to August 2021.

Demographic characteristics of participants

Most of the study participants were females (51 %). Respondents' ages fell within the range of 15 – 53 years, but the average age was 23.7 years. Over half of the respondents had only completed senior secondary education (Table 1).

Table 1: Demographic Characteristics of Study Participants (n = 300)

Characteristic	Variable	n (%)
Gender	Female	153 (51)
	Male	147 (49)
Age range	15 – 25 years	230
	26 – 35 years	(76.6)
	36 years and above	61 (20.3) 9 (3)
Highest Educational Level completed	JSCE	6 (2)
	SSCE	251 (83.6)
	NCE/OND	8 (2.7)
	HND/Bachelor's degree	29 (9.7)
	Masters and PhD	6 (2)

JSCE-Junior School Certificate Examination, SSCE-Senior School Certificate Examination, NCE-National Certificate of Education, OND/HND-Ordinary/Higher National Diploma, PhD-Doctor of Philosophy

Health literacy assessment using the newest vital sign (NVS-UK) instrument

The internal consistency of the NVS-UK gave a Cronbach's alpha value of 0.7.

Percentage of correct responses to the questions asked in the instrument ranged from 22 to 58.3 % (Table 2). The first question assessing numeracy skills was the question with the least number of correct responses (22 %), while the fifth question assessing document literacy was correctly answered by over half of the respondents (58.3 %). The total number of questions answered correctly by respondents ranged from 0 to 6, with a mean ± Standard deviation of 2.2 ± 1.7 (Figure 1). The Kruskal-Wallis test was used to compare total NVS-UK scores across respondent socio-demographic characteristics. The only statistically significant difference was seen in the highest educational level completed category (p = 0.001). A Dunn-Bonferroni post hoc test showed that the significant score variations were between SSCE and OND/NCE holders (p = 0.014) and OND/NCE holders and respondents with postgraduate degrees (p = 0.001).

Using the predefined cut-off points of the NVS-UK instrument, majority of the respondents (41.3 %) had low health literacy as their total score was 1 or less. Almost a third of respondents (32.7 %) had intermediate health literacy (Total scores of between 2 - 3), while 26 % had adequate health literacy (Total scores of 4 or higher).

Medication literacy assessment using the designed medication literacy instrument

The internal consistency of the developed medication literacy instrument also had a Cronbach's alpha value of 0.7.

Percentage of correct responses to the questions asked on the medication literacy instrument ranged from 28 to 96.7 % (Table 3). Almost all respondents correctly answered the last two questions that assessed document literacy, while only 28 % correctly answered one of the questions assessing prose literacy (Table 3). The total number of questions answered correctly by respondents ranged from 1 to 10, with a mean ± Standard deviation of 6.7 ± 2.2 (Figure 2).

Table 2: Correct responses to the questions in the NVS-UK instrument

Question no.	Correct responses n (%)
1	66 (22)
2	147 (49)
3	71 (23.7)
4	77 (25.7)
5	175 (58.3)
6	124 (41.3)

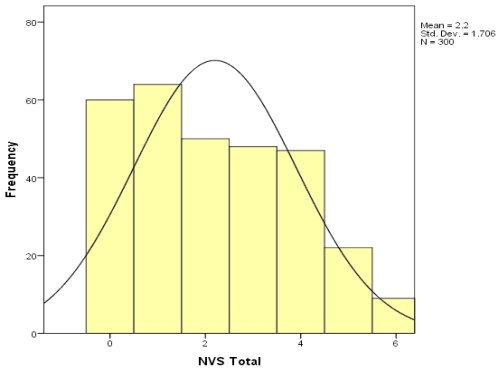

Figure 1: Respondents' Total NVS-UK score distribution

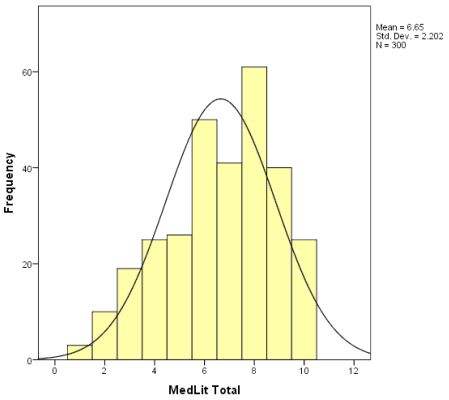

Figure 2: Respondents' total medication literacy score distribution

Table 3: Correct responses to the questions in the medication literacy instrument

Question no.	Aspect assessed	Correct n (%)
1	Knowledge of drug indication	165 (55)
2	Ability to calculate dosing intervals (1)	220 (73.3)
3	Ability to calculate dosing intervals (2)	191 (63.7)
4	Ability to understand dosing directions (1)	193 (64.3)
5	Ability to understand drug contra-indications	249 (83)
6	Ability to calculate dose (1)	201 (67)
7a	Ability to calculate dose (2)	113 (37.7)
7b	Ability to understand dosing directions (2)	84 (28)
8a	Ability to identify relevant information (1)	290 (96.7)
8b	Ability to identify relevant information (2)	290 (96.7)

Construct validation of the Developed Medication Literacy Instrument

Correlation of scores of the developed instrument against the reference standard (NVS-UK) was 0.42 ($p < 0.001$).

DISCUSSION

During this study, the construct validity of an instrument to measure medication literacy was established. The NVS-UK which had never been used within the Nigerian setting was found to have adequate reliability, and respondents' scores on the test were found to be associated with their educational level. Scores on the designed medication literacy test also had a moderate positive correlation with NVS-UK scores.

Although the NVS test was originally developed and validated for use in both English and Spanish speaking populations in the United States, the instrument has now been adapted and validated for use in several countries [13-15]. This study and other NVS validation studies conducted in China, Brazil, the United Kingdom and Turkey [11,15-17] have all yielded very similar Cronbach's alpha values of around 0.7. This is good as values for internal consistency equal to or larger than 0.70 are considered acceptable [18]. Respondents' NVS scores in several studies [14,16-17] have also been shown to be associated with educational level, as was the case in this present study. This may be explained by the fact that health literacy is a component of overall literacy. Thus, it would be expected that better health literacy levels would be seen in individuals with higher educational levels, and this has been reported in other studies [19-20].

Results from an NVS validation study conducted in Croatia reported that while majority of their respondents had difficulties with the first question that assesses numeracy skills, majority of them were able to answer the fifth question that assessed document literacy skills [14]. This was very similar to the answer patterns seen in this study. Conversely, another validation study conducted in China reported that while majority of respondents were able to answer the first four questions that assess numeracy skills alone or in combination with other skill domains, less than a third of them were able to correctly answer the sixth question which assessed prose literacy skills [17]. While it is difficult to directly compare or draw any definitive conclusions from these findings because of contextual differences, there may be geographic variations in individuals' abilities with respect to the different health/medication literacy domains.

Adequate health literacy (as defined by a score of 4 or more) on the NVS has been reported by between 28.9 – 48.7 % of respondents in other studies [14,16-17], although this study reported a slightly lower value of 26 %. Other health literacy assessments that have been conducted within the country (using a different instrument- the Brief Health Literacy Screening tool (BHLS) have reported conflicting results. A study in three local government areas in Lagos reported that almost three quarters of their respondents had adequate health literacy [7]. Conversely, another study on Diabetic patients in Warri reported that only around 12 % of respondents had adequate health literacy [8]. While the fact that these studies were conducted in different geographic areas might account for these differences, further research on health literacy levels within the country is warranted.

Despite the importance of establishing construct validity when developing a new measurement instrument, several of the medication literacy assessment instruments currently available either did not undergo this layer of testing or poorly analyzed and/reported their findings [5-6]. The NVS has however been used to establish convergent validity with other medication literacy measures including the Montana State University-CAM Health Literacy Scale [21] and a medication label literacy instrument focused on non-steroidal anti-inflammatory drugs [22]. The correlation coefficient between scores on this instrument and the NVS, were also within the range of those reported in these other studies.

Limitations of this study

The relatively young age of majority of the participants which may have affected their literacy levels. In addition, contrary to reports by Rowlands *et al* [11] which stated that the NVS-UK is quick to administer (3 min), it took many of the respondents in this study more than that (10 or more minutes) to complete the questionnaire. This would suggest that many of them found the test difficult, which is to be expected as nutrition labels are not common place within the Nigerian setting. As a result of this, it is therefore possible that this study may have underestimated respondents' health literacy levels.

CONCLUSION

This study has established a convergent validity of NVS-UK health literacy assessment questionnaire with a medication literacy

instrument designed for use in Nigeria. This new instrument may be used to reliably assess medication literacy in Nigeria.

DECLARATIONS

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Ethical approval

None provided.

Availability of data and materials

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

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the author(s) named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Samirah Abdu-Aguye, Elijah Mohammed and Fatima I Auwal conceived and designed the study, Ruth Abi, Samirah Abdu-Aguye and Aishatu Shehu collected and analyzed the data, Samirah Abdu-Aguye, Aishatu Shehu and Elijah Mohammed wrote the manuscript and all authors read and approved the manuscript for publication.

REFERENCES

1. *Santana S, Brach C, Harris L, Ochiai E, Blakey C, Bevington F, Kleinman D, Pronk N. Updating health literacy for healthy people 2030: Defining its importance for a new decade in public health. J Public Health Manag Pract 2021; 27(Suppl 6): S258-S264. doi: 10.1097/PHH.0000000000001324.*
2. *McDonald M, Shenkman L. Health literacy and health outcomes of adults in the United States: Implications for providers. Internet J Allied Health Sci Pract 2018; 16(4): 2. doi: 10.46743/1540-580x/2018.1689*
3. *Pouliot A, Vaillancourt R, Stacey D, Suter P. Defining and identifying concepts of medication literacy: An international perspective. Res Social Adm Pharm 2018; 14(9): 797-804. doi: 10.1016/j.sapharm.2017.11.005.*
4. *Shi S, Shen Z, Duan Y, Ding S, Zhong Z. Association between medication literacy and medication adherence among patients with hypertension. Front Pharmacol 2019; 10: 822. doi: 10.3389/fphar.2019.00822.*
5. *Gentizon J, Hirt J, Jaques C, Lang PO, Mabire C. Instruments assessing medication literacy in adult recipients of care: A systematic review of measurement properties. Int J Nurs Stud 2021; 113: 103785. doi: 10.1016/j.ijnurstu.2020.103785.*
6. *Pantuzza L, Nascimento E, Botelho S, Martins M, Souza Groia Veloso R, Nascimento M, Vieira L, Reis A. Mapping the construct and measurement of medication literacy: A scoping review. Br J Clin Pharmacol 2021; 87(3): 754-775. doi: 10.1111/bcp.14490*
7. *Kuyinu YA, Femi-Adebayo TT, Adebayo BI, Abdurraheem-Salami I, Odusanya OO. Health literacy: Prevalence and determinants in Lagos State, Nigeria. PLoS One 2020; 15(8): e0237813. doi: 10.1371/journal.pone.0237813*
8. *Nkemakolam U. Relationship among health literacy superstitious beliefs and self-care among diabetic patients in Warri, Nigeria (dissertation). Walden University; 2021. 64 p.*
9. *Abdu-Aguye S, Salman R, Mohammed M, Auwal F, Ma'aji H. Development and preliminary validation of an instrument to measure medication literacy in Nigeria. Bayero J Pure Applied Sci 2019; 12(1): 668-674. doi:10.4314/bajopas.v12i1.100S*
10. *Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. Front Public Health 2018; 6: 149. doi: 10.3389/fpubh.2018.00149.*
11. *Rowlands G, Khazaezadeh N, Oteng-Ntim E, Seed P, Barr S, Weiss BD. Development and validation of a measure of health literacy in the UK: the newest vital sign. BMC Public Health 2013; 13: 116. doi: 10.1186/1471-2458-13-116.*
12. *Weiss BD, Mays MZ, Martz W, Castro KM, DeWalt DA, Pignone MP, Mockbee J, Hale FA. Quick assessment of literacy in primary care: the newest vital sign. Ann Fam Med 2005; 3(6): 514-522. doi: 10.1370/afm.405.*
13. *Weiss BD. The newest vital sign: frequently asked questions. Health Lit Res Pract 2018; 2(3): e125-e127. doi: 10.3928/24748307-20180530-02.*

14. Brangan S, Ivanišić M, Rafaj G, Rowlands G. Health literacy of hospital patients using a linguistically validated Croatian version of the newest vital sign screening test (NVS-HR). PLoS One 2018; 13(2): e0193079. doi: 10.1371/journal.pone.0193079.
15. Çiftçi F, Demirci H, Çiftçi H, Ocakoğlu G. (2021). Validation of Turkish version of newest vital sign scale to assess health literacy. Bezmialem Sci 2021; 9(2): 219-225. doi: 10.14235/bas.galenos.2020.4052
16. Rodrigues R, de Andrade SM, González AD, Birolim MM, Mesas AE. Cross-cultural adaptation and validation of the newest vital sign (NVS) health literacy instrument in general population and highly educated samples of Brazilian adults. Public Health Nutr 2017; 20(11): 1907-1913. doi: 10.1017/S1368980017000787.
17. Xue J, Liu Y, Sun K, Wu L, Liao K, Xia Y, Hou P, Xue H, Shi H. Validation of a newly adapted Chinese version of the Newest Vital Sign instrument. PLoS One 2018; 13(1): e0190721. doi: 10.1371/journal.pone.0190721.
18. Nunnally, Jum C, Bernstein, Ira H. Psychometric theory (3rd Ed.). New York: McGraw-Hill; 1994.
19. Marks JR, Schectman JM, Groninger H, Plews-Ogan ML. The association of health literacy and socio-demographic factors with medication knowledge. Patient Educ Couns 2010; 78(3): 372-376. doi: 10.1016/j.pec.2009.06.017.
20. Liu Y, Wang Y, Liang F, Chen Y, Liu L, Li Y, Yao H, Chu Q. The health literacy status and influencing factors of older population in Xinjiang. Iran J Public Health 2015; 44(7): 913-919.
21. Shreffler-Grant J, Weinert C, Nichols E. Instrument to measure health literacy about complementary and alternative medicine. J Nurs Meas 2014; 22(3): 489-499. doi: 10.1891/1061-3749.22.3.489.
22. Jang SM, Jiang R, Grabe D, Pai AB. Assessment of literacy and numeracy skills related to non-steroidal anti-inflammatory drug labels. SAGE Open Med 2019; 7: 2050312119834119. doi: 10.1177/2050312119834119.