Patient Safety & Quality Improvement Journal
http://psj.mums.ac.ir
PSQI

# Nurses' Self-Reported Practices and Perceived Barriers of Medication Administration Safety in State Hospitals in Northern Nigeria

*Yahaya Jafaru[1], Mubarak Hassan[2]

*1. Department of Nursing Science College of Health Sciences, Federal University Birnin-Kebbi, Kebbi State, Nigeria.*
*2. Federal College of Education Gusau, Zamfara State, Nigeria.*

**ARTICLEINFO**

***Article type:***
*Original Article*

***Article History*:**
Received: 09-May-2021
Accepted: 07-Jul-2021

***Key words:***
*Medication Administration*, *Nurses*, *Perceived barriers*, *Safety*

**ABSTRACT**

***Introduction:***
Administering medication is a vital aspect of patients' treatment and nurses play an essential role in it, with the responsibility of safety during the procedure. Nurse administrators are showing concern about patient safety, and one of the first steps to reduce medication administration errors is assessing the factors contributing to those errors.

***Materials and Methods:***
The study was descriptive and adopted cross-sectional design. The Medication Administration Safety Assessment Tool and instrument for assessing barriers to medication administration safety were used for data collection. Proportionate and systematic samplings were used in selecting the respondents. Data collected were analysed using SPSS version 26. Chi-square and ANOVA statistical tools were used for inferential analysis.

***Results:***
The majority (40.7%) of the respondents were having Good medication administration safety practices, but 19.1% had poor medication administration safety practices. Majority (41.6%) of the respondents had very low perceived barriers to medication administration safety. There was no significant association between hospital working experience and medication administration safety practices, $P>0.05$. The professional qualification of the respondents was associated with perceived barriers to medication administration safety, $P<0.05$.

***Conclusion:***
The medication administration safety practices range from good to very good practices, and there was a considerable number of respondents with poor practices. Moreover, a significant number of respondents perceived the barriers to medication administration safety practices as moderate, high or very high. These call for the need for frequent knowledge update through conferences, workshops and educational forums among nurses. Frequent investigation and mitigation of factors aggravating hospitals' medication administration errors should be given more emphasis.

► ***Please cite this paper as:***
*Jafaru Y, Hassan M. Nurses' Self-Reported Practices and Perceived Barriers of Medication Administration Safety in State Hospitals in Northern Nigeria. Journal of Patient Safety and Quality Improvement. 2021; 9(3): 155-162.*
*Doi: 10.22038/psj.2021.57610.1325*

**Corresponding Author:***
*Department of Nursing Science College of Health Sciences, Federal University Birnin-Kebbi, Kebbi State, Nigeria.*
*E-mail: jafaruyahaya2015@yahoo.com*

## Introduction

The administration of medication to patients is a complex procedure carried out by professional nurses (1). It is one of their most crucial professional duties (2) consuming up to 40% of their time (3). Administering medication is a vital aspect of patients' treatment and nurses play an essential role in it, with the responsibility of safety during the procedure on them (4). This is crucial because patients attend healthcare organizations with the expectation of safe care (6), and nurse administrators are showing concern about patient safety (5). But the professional aim of safety in healthcare delivery is always challenged with rampant and persistent medical errors (6). Thus, medication administration requires adequate attention to reduce the healthcare risk that could lead to harm or even death of the patient (4). This is because studies revealed that errors in medication administration occur most frequently during the administration stage (7). Therefore, improving patient safety requires nurses to interrupt all medication errors before it gets to the patient (8).

Patient safety is the absence of preventable harm to patients and the prevention of unnecessary harm by healthcare professionals (9). Safety in medication administration is important since the most common type of medical error occurs during medication administration (Committee on Identifying & Preventing Medication Errors cited in Smeulers et al. (10). In developing countries, studies revealed a very high medication administration errors (MAEs) rate of 56.4% (11) and 94% (12). However, WHO (13) and Mekonnen et al. (7) asserted that medication errors in African health care settings are common health problems. In respect of this, the review of researches on adverse drug events and medication errors in African hospitals revealed that 8.4% of inpatients experienced adverse drug events and it leads to 2.8% of admissions (7). In Nigeria, a national survey conducted by Ogunleye et al., (14) revealed that the prevalence of self-reported medication errors was 47%. But according to Iloh et al. (15), there are scanty research on medical errors, and medical errors have not been quantified in Nigeria.

Parveen et al. (16) outlined the factors associated with errors in medication administration made by nurses as neglecting the medication administration rule, presume lack of time, medication miscalculations, work overload leading to extreme tiredness, low level of knowledge and proficiency, poor working condition, and inadequate work experience. Thus, adherence to the principles of patient safety by nurses is necessary for the success of healthcare interventions and prevention of practice errors and in achieving safer healthcare systems (17). However, there is no healthcare institution that is immune to a medication error, and every patient is prone to at least one medication error every day (18). According to Khammarnia et al. (19), one of the first steps to reduce MAE is assessing the factors contributing to those errors. But in Zamfara state Nigeria, there was no known study on medication administration safety and its barriers. Therefore, this study was on nurses' self-reported practices and perceived barriers of medication administration safety in Zamfara state hospitals in northern Nigeria.

## Materials and Methods

The study was descriptive and adopted cross-sectional design in examining the nurses' self-reported practices and perceived barriers of medication administration safety in Zamfara state hospitals. The population of the study was the nurses and midwives employees of Zamfara State Government, and working in secondary and tertiary hospitals of the state. However, nurses working as administrators or other places rather than the hospital were excluded from the study. Two instruments were used for data collection. The Medication Administration Safety Assessment Tool was adopted from Araújo et al. (20). The tool is a self-administered questionnaire, made up of 9 domains with 27 items.

The domains include right patient, right medication, right route, right time, right dose, right record, right guidance, right way, and right answer. It is 5 point Likert scale, 1 = strongly disagree, 2 = disagree, 3 =

neutral, 4 = agree, 5 = strongly agree. Content validity was used to verify the validity of the instrument, and the reliability of the instrument was 0.85 verified by internal consistency as measured by Cronbach's Alpha (20). The measuring scales used for this instrument were: mean values of 0.0-3.5, 3.6-4.0, 4.1-4.5, and 4.6-5.0 as poor, good, very good and excellent medication administration safety practices respectively.

The second instrument was researcher constructed, 17 items self-administered questionnaire used in assessing barriers to medication administration safety, and occurrence of MAEs. The first 12 items assessed barriers to medication administration safety using 5 point Likert scale, 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

The validity of the instrument was verified using face and content validity. Copies of the instrument were given to three experience scholars on clinical nursing practice who vetted it and ascertained its validity. A hospital not included in the study was used in testing the reliability of the instrument. The instruments amounting to 10% of the sample size was administered, and its reliability was found to be 0.82 using Cronbach's Alpha. The measuring scales used for this section were: mean values of 0.0-3.0, 3.1-3.5, 3.6-4.0, 4.1-4.5, and 4.6-5.0 as very low, low, moderate, high and very high perceived barriers respectively. The last five items of this instrument assessed the occurrence of MAEs.

The sample size was 248, calculated using Cochran's sample size determination formula. One and the only state own tertiary hospital was purposively selected for the study, and three secondary hospitals were selected from each senatorial zone using simple random sampling. Proportionate sampling was applied in allocating the number of respondents to selected hospitals, while systematic sampling was used in selecting the respondents from each hospital. The researcher visited the selected hospitals, and the respondents were contacted to their respective wards and units. Respondents were given 72 hours to answer the questionnaires, after which the researchers retrieve the questionnaires. However, the retrieved questionnaires were 209. Making the response rate to be 84.3%. Data collected were analysed using SPSS version 26, with descriptive statistics in frequencies and percentages as well as means and standard deviations.

Chi-square and ANOVA statistical tools were used for inferential analysis. Ethical approval for the research was obtained from Zamfara State Health Research Ethical Committee and permission to conduct the research was obtained from the selected hospitals' management.

Informed consent was taken from the respondents individually before involving in the research. Respondents participated voluntarily, and the information provided was only used in answering the research questions and was treated with anonymity and utmost confidentiality.

## Results

Table 1 shows that the majority (32.5%) of the respondents were having 1-5 years of experience. The respondents with post-registration qualification were 24.9%.

**Table 1:** Socio-demographic variables of the respondents

| Years of experience | Frequency | Percentage |
|---|---|---|
| < 1 Year | 50 | 23.9 |
| 1-5 Years | 68 | 32.5 |
| 6-10 Years | 41 | 19.6 |
| >10 Years | 50 | 23.9 |
| Total | 209 | 100 |
| Professional qualification | | |
| Registered Nurse | 93 | 44.5 |
| Registered Midwife | 64 | 30.6 |
| Post-registration Qualification | 52 | 24.9 |
| Total | 209 | 100 |

Table 2 revealed that the majority (40.7%) of the respondents were having Good medication administration safety practices, but 19.1% had poor medication administration safety practices.

**Table 2:** Level of Nurses practices of medication administration safety

| Levels | Frequency | Percentage |
|---|---|---|
| Poor medication administration safety practices | 40 | 19.1 |
| Good medication administration safety practices | 85 | 40.7 |
| Very good medication administration safety practices | 63 | 30.1 |
| Excellent medication administration safety practices | 21 | 10.0 |
| Total | 209 | 100 |

Table 3 indicates that the majority of the respondents across the years of experience brackets had Good medication administration safety practices, except >10 years bracket in which the majority of the respondents had very good medication administration safety practices. The majority (37.6%) of Registered Nurses (RN) had very good medication administration safety practices. The Registered Midwives (RM) had the highest percentage (28.1%) with Poor medication administration safety practices. There was no statistically significant association between hospital working experiences and medication administration safety practices, P>0.05. There was no statistically significant association between professional qualification and medication administration safety practices, P>0.05.

**Table 3:** Association in levels of nurses practices of medication administration safety by working experience and professional qualification

| Levels | Hospital working experience (Years) | | | | |
|---|---|---|---|---|---|
| | **<1** | **1-5** | **6-10** | **>10** | **P-Value $\chi^2$** |
| | **F(P)** | **F(P)** | **F(P)** | **F(P)** | |
| Poor medication administration safety practices | 8(16) | 15(22.1) | 10(24.4) | 7(14) | 0.31 |
| Good medication administration safety practices | 22(44) | 31(45.6) | 18(43.9) | 14(28) | |
| Very good medication administration safety practices | 14(28) | 17(25) | 10(24.4) | 22(44) | |
| Excellent medication administration safety practices | 6(12) | 5(7.4) | 3(7.3) | 7(14) | |
| **Total** | 50(100) | 68(100) | 41(100) | 50(100) | |
| **Levels** | Professional qualification | | | | |
| | **RN** | **RM** | **PRQ** | **P-Value $\chi^2$** | |
| | **F(P)** | **F(P)** | **F(P)** | | |
| Poor medication administration safety practices | 15(16.1) | 18(28.1) | 7(13.5) | 0.07 | |
| Good medication administration safety practices | 31(33.3) | 29(45.3) | 25(48.1) | | |
| Very good medication administration safety practices | 35(37.6) | 13(20.3) | 15(28.8) | | |
| Excellent medication administration safety practices | 12(12.9) | 4(6.25) | 5(9.6) | | |
| **Total** | 93(100) | 64(100) | 52(100) | | |

F=frequency, P=percentage, RN=Registered Nurse, RM=Registered Midwife, PRQ=Post Registration Qualification

Table 4 shows that respondents with working experience >10 years had the highest mean value (4.08) of medication administration safety practices than other working experiences of <1 year, 1-5years and 6-10 years. Respondents that were RN had the highest mean value (4.00) than respondents that were RM and those that had post-registration qualification. There was no statistically significant difference in the mean values of different working experience categories, P>0.05. There was no statistically significant difference in mean values of different professional qualifications. P>0.05.

**Table 4:** Differences in Nurses practices of medication administration safety by working experience and professional qualification

| **Hospital working experience (Years)** | **Mean value** | **Standard deviation** | **F** | **P-value** |
|---|---|---|---|---|
| <1 | 3.94 | 0.54 | 2.43 | 0.07 |
| 1-5 | 3.84 | 0.50 | | |
| 6-10 | 3.85 | 0.50 | | |
| >10 | 4.08 | 0.52 | | |
| **Professional Qualification** | **Mean value** | **Standard deviation** | **F** | **P-value** |
| Registered Nurse | 4.00 | 0.52 | 2.44 | 0.09 |
| Registered Midwife | 3.82 | 0.43 | | |
| Post-registration Qualification | 3.91 | 0.59 | | |

Table 5 reveals majority (41.6%) of the respondents had very low perceived barriers to medication administration safety, with the least percentage on very high perceived barriers.

**Table 5:** Levels of Nurses' Perceived Barriers to Medication Administration Safety

| **Perceived Barriers** | **Frequency** | **Percentage** |
|---|---|---|
| Very-low perceived barrier | 87 | 41.6 |
| Low-perceived barrier | 53 | 25.4 |
| Moderate perceived barrier | 29 | 13.9 |
| High perceived barrier | 24 | 11.5 |
| Very-high perceived barrier | 16 | 7.7 |
| **Total** | 209 | 100 |

Table 6 indicates that the majority of the respondents within different hospital working experiences had either very low or low perceived barriers to medication administration safety. Across all the different professional qualifications majority of the respondents had very low perceived barriers. However, 53.1% of RM had very low perceived barriers, while 34.4% of RN having very low perceived barriers. Also, RM had the lowest (0.0) very high perceived barriers, and respondents with post-registration qualification had the highest (11.5%) very high perceived barriers. There was a statistically significant association between perceived barriers to medication administration safety and hospital working experiences, $P<0.05$. There was a statistically significant association between the professional qualifications of the respondents and perceived barriers to medication administration safety, $P<0.05$.

**Table 6:** association of perceived barriers to medication administration safety by hospital working experience and professional qualification

| **Levels** | **Hospital working experience (Years)** | | | | |
|---|---|---|---|---|---|
| | **<1** | **1-5** | **6-10** | **>10** | **P-Value $\chi^2$** |
| | **F(P)** | **F(P)** | **F(P)** | **F(P)** | 0.003 |
| Very low perceived barrier | 17(34) | 34(50) | 11(26.8) | 25(50) | |
| Low perceived barrier | 12(24) | 18(26.5) | 16(39.0) | 7(14) | |
| Moderate perceived barrier | 11(22) | 6(8.8) | 10(24.4) | 2(4.0) | |
| High perceived barrier | 6(12) | 6(8.8) | 4(9.8) | 8(16) | |
| Very high perceived barrier | 4(8) | 4(5.9) | 0(0.0) | 8(16) | |
| **Total** | 50(100) | 68(100) | 41(100) | 50(100) | |
| **Professional qualification** | | | | | |
| **Levels** | **Registered Nurse** | **Registered midwife** | **Post-registration qualification** | | **P-Value $\chi^2$** |
| | F(P) | F(P) | F(P) | | 0.03 |
| Very low perceived barrier | 32(34.4) | 34(53.1) | 21(40.4) | | |
| Low perceived barrier | 20(21.5) | 20(31.3) | 13(25) | | |
| Moderate perceived barrier | 16(17.2) | 7(10.9) | 6(11.5) | | |
| High perceived barrier | 15(16.1) | 3(4.7) | 6(11.5) | | |
| Very high perceived barrier | 10(10.7) | 0(0.0) | 6(11.5) | | |
| **Total** | 93(100) | 64(100) | 52(100) | | |

Table 7 reveals that hospital working experience 6-10 years had a slightly higher mean value (3.29) and with the lowest standard deviation (0.73) of perceived barriers to medication administration safety by professional qualifications. The mean value of respondents with >10 years was 3.24, with high variability of 1.09. It also shows that RM had the lowest mean value (2.79) with low variability (0.76). There was no statistically significant difference in mean values of perceived barriers to medication administration safety between years of experience, P>0.05. There was a statistically significant difference in mean values of perceived barriers to medication administration safety between professional qualifications, P<0.05.

**Table 7:** Differences in Perceived Barriers to Medication Administration Safety by working experience and professional qualification

| **Hospital working experience (Years)** | **Mean value** | **Standard Deviation** | **F** | **P-value** |
|---|---|---|---|---|
| <1 | 3.25 | 0.92 | 1.18 | 0.32 |
| 1-5 | 3.01 | 0.88 | | |
| 6-10 | 3.29 | 0.73 | | |
| >10 | 3.24 | 1.09 | | |
| **Professional Qualification** | **Mean value** | **Standard deviation** | **F** | **P-value** |
| Registered Nurse | 3.37 | 0.95 | 8.77 | 0.000 |
| Registered Midwife | 2.79 | 0.76 | | |
| Post-registration Qualification | 3.30 | 0.91 | | |

Moreover, the result indicates 21.1% of the respondents encountered the occurrence of MAE within the last year. The majority (54.5%) of which had 1-2 times the number of occurrences, while only 6.8% had 5-6 times the number of occurrences. Administration of wrong medication was the highest (36.4%) MAE, followed by dosage issues (15.9%). But 18.2% of the respondents attributed MAEs to work overload. It was found that 9.1% of the total MAE resulted in patients' injury, while 4.5% resulted to death.

## Discussion

In this study, over 80% of the nurses were having either good, very good or excellent medication administration safety practices. This is contrary to a study by Mumbi et al. (21) to assess the adherence of medication administration guidelines among nurses in a Mission Hospital in Meru, Kenya, in which it was found that the overall level of adherence was low with 62.4% of respondents having low adherence level. This difference may be because the authors used an observation checklist among their instruments for data collection. Also, in this study, there was no significant association between hospital working experience and medication administration safety practices. Thus, the finding does not support the statistical influence of years of working experience on medication administration safety practices. This is in accordance with finding from a survey on nursing perceptions of medication administration practices, perceived sources of errors and reporting behaviours in Quebec, where it was found that years of experience was not associated with preparing/carrying out medications (22). Moreover, there was no significant association between professional qualification and medication administration safety practices. This finding is in disagreement with a study conducted by Abd Elmageed et al. (23) in which a statistically significant association between nurses' qualification and their practice regarding medication administration was found. However, the later study includes observation as part of data collection methods. Though there was no significant difference between the mean value of the different working experience categories, respondents with working experience >10 years had slightly highest mean value of medication administration safety practices than other working experiences of <1 year, 1-5years and 6-10 years. Thus, the working

experience might be a factor determining the practice of safe medication administration. The RN respondents had a slightly higher mean value of medication administration practice than other professional qualifications. However, there was no statistically significant difference.

Most of the respondents of this study were found to have very low perceived barriers to safe medication administration with a statistically significant association between perceived barriers to medication administration safety and hospital working experience. The finding is in accordance with a study conducted in Nigeria by Ayorinde and Alabi (4) where it was found that there was a statistical significant association between perceived reasons for the occurrence of MAEs and nurses cadres (based on years of experience). Moreover, in this study, the professional qualification of the respondents was associated with perceived barriers to medication administration safety. Respondents that were RM had the highest percentage in very low perceived barrier compared to those that were RN and those with any post-registration qualification. This could be because most of the RM work in the labour room where there is usually few patients and a low level of distractions.

Also, as per the aforementioned assertion, it was found that there was a significant difference in mean values of perceived barriers to medication administration safety between professional qualifications. The mean value difference of perceived barriers to medication administration safety was lower among the RM respondents compare to respondents that were RN and those with post-registration qualifications. However, there was no significant difference in mean values of perceived barriers to medication administration safety between years of experience.

The results of this study also pointed out that only 21.1% of the respondents had the occurrence of MAE among which only 6.8% had it 5-6 times. This shows the low level of nurses that encounter MAEs compared to other studies like a study by Wondmieneh et al. (24) where 68.1% of nurses were involved in MAEs in the previous 12 months. However, in Tsegaye et al. (25), the dosage errors done (both overdose and underdose) accounted for 37.5%, which is contrary to the finding of this study in which Dosage issues accounted for 15.9%. Both the two studies involve observation of nurses during medication administration, which may be a reason for the differences with this study which used only the self-reporting method. The results of this study revealed that 9.1% of the total MAEs resulted to patients' injury, with 4.5% that resulted to death.

## Conclusion

Though in this study majority of the medication administration safety practices ranges from good to very good practices, there was still a concern in which there was a considerable number of respondents with poor medication administration safety practices. Moreover, a significant number of respondents perceived the barriers to medication administration safety practices as moderate, high or very high. Also, finding respondents testifying the occurrence of patients' injuries and even death due to MAEs is alarming. These call for the need for frequent knowledge update through conferences, workshops and educational forums among nurses. Frequent investigation and mitigation of factors aggravating hospitals' MAEs should be given more emphasis.

## Acknowledgement

We thank the Zamfara State Health Research Ethical Committee for reviewing the proposal of the study and granting permission to conduct the research. Our appreciation also goes to the respective hospitals' management for permitting us to conduct the study. We are grateful to all our respondents that gave their time in answering the questionnaires.

## References

1. Mohmmed RGA, El-sol A E H. Nursing Innovations: Medication Administration Errors and Safety. IOSR-JNHS. 2017; Volume 6, Issue 3 Ver. IV. PP 75-85. DOI: 10.9790/1959-0603047585

2. WHO. World Health Organization Medication errors: Technical series on safer primary care. 2016. ISBN 978-92-4-151164-3.

3. Dumo AMB. Factors affecting medication errors among staff nurses: basis in the

formulation of medication information guide. IAMURE Int J Health Educ. 2012; 1(1):88–149. DOI:10.7718/IAMURE.IJHE.V1I1.210
4. Ayorinde MO, Alabi PI. Perception and contributing factors to medication administration errors among nurses in Nigeria. International Journal of Africa Nursing Sciences. 2019; doi.org/10.1016/j.ijans.2019.100153
5. Lall S. The Lived Experience of Making a Medication Administration Error in Nursing Practice. International Journal of Nursing. 2017; Vol. 4, No. 2, pp. 11-21. DOI: 10.15640/ijn.v4n2a2
6. Gaffney TA, Hatcher BJ, Milligan R, Trickey, A. "Enhancing Patient Safety: Factors Influencing Medical Error Recovery Among Medical-Surgical Nurses" OJIN: The Online Journal of Issues in Nursing. 2016; Vol. 21, No. 3, Manuscript 6. DOI: 10.3912/OJIN.Vol21No03Man06
7. Mekonnen AB, Alhawassi TM, McLachlan AJ, Brien JE. Adverse Drug Events and Medication Errors in African Hospitals: A Systematic Review. Drugs - Real World Outcomes. 2018; 5:1; 1-24 https://doi.org/10.1007/s40801-017-0125-6.
8. Alemu W, Belachew T, Yimam I. Medication administration errors and contributing factors: a cross sectional study in two public hospitals in southern. Ethiopia. Int J Africa Nurs Sci. 2017; 7:68–74. https://doi.org/ 10.1016/ j.ijans. 2017. 09.001
9. WHO. Patient Safety. 2019. [Internet] 2019. [Accessed 13th April 2021] Available: https:// www.who.int/patientsafety/ en/
10. Smeulers M, Onderwater AT, Van zwieten MCB, Vermeulen H. Nurses' experiences and perspectives on medication safety practices: an explorative qualitative study. J Nurs Manag, 2014. DOI: 10.1111/jonm.12225
11. Feleke SA, Mulatu MA, Yesmaw YS. Medication administration error: magnitude and associated factors among nurses in Ethiopia. BMC Nurs. 2015; 14 (1):53. DOI: 10.1186/ s12912-015-0099-1
12. Blignaut AJ, Coetzee SK, Klopper HC Ellis SM. Medication administration errors and related deviations from safe practice: An observational study. J Clin Nurs. 2017; 1–14. doi: 10.1111/ jocn.13732
13. WHO. Global patient safety. Medication without Harm: WHO; 2017. [Internet] [Accessed 25th March, 2021]. Available at https: //www.who.int/patientsafety/medication-safety/medication-without-harm-brochure/en/.
14. Ogunleye OO, Oreagba IA, Falade C. Isah , A, Enwere O, Olayemi S et al.. Medication errors among health professionals in Nigeria: A national survey. Int J Risk Saf Med. 2016; 28(2):77-91. doi: 10.3233/JRS-160721.
15. Iloh GU, Chuku A, Amadi AN. Medical errors in Nigeria: A cross-sectional study of medical practitioners in Abia State. Arch Med Health Sci. 2017; 5:44-9. DOI: 10.4103/amhs.amhs_1_17
16. Parveen N, Afzal M, Hussain M. Knowledge regarding Safe Administration of Parenteral Medication among Nurses. European Academic Research. 2019; Vol. VII, Issue 1
17. Rashvand F, Ebadi A, Vaismoradi M, Salsali M, Yekaninejad MS, Griffiths P et al. The assessment of safe nursing care: Development and psychometric evaluation. J. Nurs. Manag. 2017; 25: 22–36. DOI: 10.1111/jonm.12424
18. Mohanty S. Awareness of Medication Error, Medication Management and Prevention among Staff Nurses in IMS and Sum Hospital, Odisha. NUJHS. 2016; Vol. 6, No. 4, 2249-7110
19. Khammarnia M, Ravangard R, Barfar E, Setoodehzadeh F. Medical Errors and Barriers to Reporting in Ten Hospitals in Southern Iran. Malays J Med Sci. 2015; *22*:57–63. PMID: 28729811
20. Araújo PR, Lima FET, Ferreira MKM. de Oliveira SKP, de CarvalhoI REFL, de Almeida PC. Medication administration safety assessment tool: construction and validation. Rev Bras Enferm. 2019; 72(2):329-36. doi: http://dx. doi.org/ 10.1590/0034-7167-2018-0340
21. Mumbi M, Mwenda C, Njoroge G. Njau S. Adherence to Medication administration guidelines among Nurses in a Mission Hospital in Meru, Kenya. International Journal of Scientific and Research Publications. 2019; 9(9): 421-424
22. Armutlu M, Foley M, Surette J. Survey of Nursing Perceptions of Medication Administration Practices, Perceived Sources of Errors and Reporting Behaviours. Healthcare Quarterly. 2008; 11 (Sp). doi:10. 12927/ hcq. 2008. 19651
23. Abd Elmageed EM, Soliman HM, Abdelhamed HM. Knowledge, Attitude and Practice of Nurses in Administering Medications at Mansoura University Hospitals. Journal of Nursing and Health Science. 2020; Volume 9, Issue 4 Ser. VI
24. Wondmieneh A, Alemu W, Tadele N, Demis A. Medication administration errors and contributing factors among nurses: a cross sectional study in tertiary hospitals, Addis Ababa, Ethiopia. BMC Nurs. 2020; 19, 4. https://doi. org/10.1186/s12912-020-0397-0
25. Tsegaye D, Alem G, Tessema Z, Alebachew W. Medication Administration Errors and Associated Factors among Nurses. International Journal of General Medicine. 2020; Volume 13: 1621-1632.