International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Patient Knowledge of their Dispensed Drugs in Rural Gambia

D. Ameh[a]*, A. Wallymahmmed [b] , G. Mackenzie [c]

[a] *University of Liverpool,Liverpool, Merseyside L69 3BX, United Kingdom.*

[a,b,c] *Medical Research Council, Basse Field Station, P.O. Box 273 Banjul, The Gambia*

[a] *dave_ameh@yahoo.com*

[b] *akhtar.wallymahmed@my.ohecampus.com*

[c] *gmackenzie@mrc.gm*

Abstract

Patient knowledge of dispensed medication as they exit health facilities holds a central place in the overall outcome of treatment, as a lack of knowledge can result in medication errors. A cross-sectional survey collecting quantitative data from patients following dispensation of prescribed drugs from a hospital pharmacy aimed at assessing patients' knowledge of dispensed drugs and to determine potential factors that may influence level of knowledge.

A total of 336 participants aged over 18 years old were approached to take part in the study. A convenience sample was used and participants were selected if there fit the selection criteria and agreed to take part. Participants were interviewed consecutively by trained study nurses using a modified version of the standard questionnaire developed by WHO/DAP. Patient responses were assessed on their knowledge of dosage, duration of treatment and purpose of dispensed drugs. Of the 571 patients responses (from the 336 participants) following interview on drug dosage, duration of treatment and purpose of dispensed drugs, 345 (60.4%) had correct recall for dosage, while only31 (5.4%) and 98 (17.2%) could recall correctly duration of treatment and purpose of dispensed drugs respectively.

---

* Corresponding author.

E-mail address: dave_ameh@yahoo.com.

Overall, only 92 (16.1%) of patients responses met the predefined “good” level of knowledge of dispensed drug. Age and level of education are predictors of patient knowledge of dispensed medication in rural Gambia.

The overall patient knowledge of dispensed drugs is very poor and this has implications for treatment compliance, outcome and cost in a resource poor setting. Further studies are needed to investigate the quality of dispensing instruction. The present study is of public health significance as it has demonstrated that patient knowledge of their dispensed drugs is poor, and if corrected will improve patient safety with regards to dispensed medication.

Keywords: patient; knowledge; dosage; duration; purpose.

1. Introduction

Millions of patients worldwide suffer some form of disability, injury or death as a result of health-care associated infections, misdiagnosis, delays in treatment, injury from medical devices and adverse events due to medication errors [1]. United States Department of Veterans Affairs and Veterans Health Administration (VHA) defined adverse drug event (ADE), adverse drug reaction (ADR) and medication error as follows:

ADEis “an injury resulting from the use of a drug. Under this definition, the term ADE

includes harm caused by the drug (adverse drug reactions and overdoses) and harm from the use of the drug (including dose reductions and discontinuations of drug therapy) [2].”

In addition, ADRis a “response to a drug which is noxious and unintended and which occurs at doses normally used in man for prophylaxis, diagnosis, or therapy of disease or for the modification of physiologic function [2].”

Medication errors are also classified as “mishaps that occur during prescribing, transcribing, dispensing, administering, adherence, or monitoring a drug. Examples of medication errors include misreading or miswriting a prescription [2]."

Medical errors result in many preventable injuries and deaths; it is estimated that worldwide adverse drug events occur in between 4% to 16% of all hospital patients, with unsafe blood and medication error contributing significantly to patient harm [3]. According to Ndihokubwayo [3], 'patient safety' is “a concept that refers to processes or structures which, when applied, reduce the possibility of adverse events resulting from exposure to the health-care system across a range of diseases and procedures”. Achieving patient safety is a worldwide burden, particularly in Africa where the health system is poorly structured and there is not sufficient focus on patient safety [3]. In addition, there is poor health infrastructures that fail to address issues of appropriate medication use, quality and safety, as well as inadequate funding of patient safety programmes. As a result, in 2008, the WHO Regional Director for Africa listed ten actions that could improve patient safety in the Africa Region. The listed actions were as follows:

1. The development of national policy for patient safety;

2. Raising patient safety awareness amongst and stressing the importance of the concept;

3. Ensuring safe patient surgical management;

4. Minimizing healthcare-associated infections;

5. Ensuring adequate funding for patient safety activities and programme within the sub-region.

6. Improving knowledge on patient safety

7. Creating an enabling environment for learning in patient safety;

8. Re-orienting health systems to make patient safety an integral part of quality care;

9. Ensuring appropriate use, quality and safety of medicines; and

10. Strengthening surveillance and capacity for research.

Adequate patient knowledge of their dispensed medication as they exit health facilities holds a central place in the overall outcome of their treatment. Lack of patient knowledge of their dispensed medication is one of the factors responsible for medication errors associated with poor drug safety in patients [4].Therefore, the role of the health care professional in ensuring that patients acquire adequate knowledge about their dispensed drugs cannot be over emphasized because it can significantly enhance good compliance to treatment and also prevent medical errors. According to the WHO regional director for Africa (Dr Luis Sambo),

“Every patient has the right to treatment using the safest technology available in health facilities. Therefore, all health care professionals and institutions have obligations to provide safe and quality health care and to avoid unintentional harm to patients [2].”

Inadequate patient knowledge of their dispensed medication is a product of poor dispensing procedure that hinges on factors such as, transcribing, dispensing instruction and dispensing time. According to [5,6] patient knowledge is a prerequisite for compliance to prescribed medication. It has been suggested that poor adherence to treatment may be largely associated with improper dispensing procedure and inadequate labelling of medication [5]. Patient education of their medication by health care providers therefore, is most important as it forms an integral part of disease management particularly for patients with chronic illnesses. Adequate patient knowledge of their dispensed medication as they exit the health facility is critical in terms of the quality of information received during their interaction with both the attending physician and dispenser, contributing to patient compliance rate and therefore patient treatment outcome [7].Inadequate knowledge of dispensed medication by patients can be a patient drug safety issue and could result in some forms of preventable adverse drug events[4]. Hence, more research are needed to generate data that will enable countries like The Gambia and

other developing nations in Africa to find out more about the level of patient knowledge of their dispensed medication and how it can affect treatment outcome.

Furthermore, adequate patients' knowledge about their medication holds a central place in the level of adherence to their medications and to achieve this, dispensing time needs to be adequate [5,7]. There is currently no gold standard [9] for what may be considered adequate dispensing time. Achieving adequate dispensing times in health facilities in developing countries will continue to remain a challenge as a result of high disease burden, overcrowding of health facilities and fewer qualified health workers [10]. Multiple factors are responsible for overcrowded health facilities; these include factors such as fewer health facilities, high prevalence of infectious diseases, and poor treatment outcome resulting in early return to hospital [11]. The number of patients attending the pharmacy departments in health centres may directly affect the speed with which pharmacy technician dispenses drugs to patients. This can in return result in errors such as distributing the wrong drug to the patient, incorrect dosage instructions and wrong labeling.

As discussed above, appropriate and adequate patient's knowledge of the dispensed medication is most important for adherence and in the prevention of medication errors [7,12]. Hence it is important that this issue is addressed at national and international levels in order to ensure that it is well integrated into public health policy platform, especially for developing countries. This can only be achievable if adequate data can be made available to policy makers in developing countries where the concept of patient knowledge of their dispensed drug is still very new. The purpose of this study is to assess patients' knowledge of their dispensed drugs and to determine potential factors that may influence their level of knowledge. Data generated from this study may help public health policy makers to improve patient drug safety services in low income countries.

2. Review of Literature

2.1. Predictors of patient level of knowledge of dispensed medication

In many developing countries, the medication dispensing process can be inadequate ranging from inadequate labelling to insufficient medication information given by health workers to patients [13]. For labelling to be used as a tool to assess the dispensing procedure, the qualification of the dispenser is important; an unqualified health worker may be more prone to labelling drugs incorrectly when compared with a qualified person [5]. Boonstra *et al*[5] compared the quality of dispensed drug labelling from qualified pharmacy technicians to those of unqualified dispensers in a study of 2994 patients receiving dispensing drugs from pharmacies. They reported that family welfare educators and pharmacy technicians had higher labelling score (3.15 and 2.98 respectively) when compared with untrained staff with the lowest score of 2.60. Lebitsa *et al*[14] found that only 11% and 21% of drugs dispensed at clinics and health posts respectively in Botswana were adequately labeled. In addition, only 56% of patients at clinic and 57% of patients from health posts were given sufficient information about their drugs.

2.2. Levels of patient knowledge

[15] reported that in Nepal, 81% of patients had correct knowledge of the use of their prescribed drugs. Appropriate labelling (by four B. Pharm students), however, was1.4%. Hence, [15] demonstrated that medication labelling is very poor in Nepal. Percentage of adequate labelling found in other countries are equally low, examples include results from India 18.5% [16] and Cambodia 0%[17]. In Nepal, [15] found patients' knowledge to be 81% when using the WHO patient care indicator. Their results are comparable to other similar work, such as that of [18] in Burkina Faso where they found patient knowledge to be at 68%, and [5] in Botswana where patients' knowledge were found to be at 83%. [5] reported that 83% of patients recalled correctly, the dosage of theirmedication, 44% were able to recall the correct duration of treatment, whilst 31% of patients recalled the treatment name correctly. [5] controlled for observer bias when they stated that "In order to reduce observer bias, the health facilities were not informed about the survey and schedule of the team. The lead nurse at the health facility informed the patients in the waiting room about the survey in general terms, eliciting their consent to participate".

[18] in Burkina Faso reported that only 33% of patients were provided with adequate information on dispensed drugs and 68% of patients were able to recall their drug dosage shortly after dispensing.

[5] assessed the quality of prescribing and dispensing through the use of labelling and knowledge score. They assessed the quality of drug labelling by calculating labelling scores using the following attributes: name of patient and drug name, strength, dosage and volume. Incorrect or no labelling score (for each attribute) =0 and 1 for correct labelling of each attribute. Hence the maximum score=5 and the minimum score= 0. Similarly, the quality of patient knowledge was assessed by calculating the knowledge score obtained immediately after dispensing from the patient recall of drug name, drug dosage , duration of treatment and reason for prescription(incorrect recall for each attribute=0, correct recall of each attribute=1. Hence maximum score=4 and minimum score =0). [5] concluded that "The labelling score is a useful indicator of the quality of dispensing, and the knowledge score of both the quality of prescribing and of dispensing".

The patient care indicators developed by WHO were meant to address key aspects of what patients experience at health facilities, and how well they have been prepared to handle the medication they have been prescribed and dispensed. It is important that patient for whom drugs are prescribed should, at a minimum, receive well-labeled medications, and should understand how to take each drug, the purpose of the drug, duration of treatment and possible side-effects [19]. Husayn and David [20] reported that patient ability to recall the name, dosage, frequency of administration and reason for drug being prescribed immediately after dispensing was poor in a hospital that provided care for elderly patients. The author used the mental test score to enhance the reliability of the study, but they failed to state clearly what basis certain patients were excluded from the study. [8] assessed patient knowledge of prescribed drugs in fifty patients attending a hypertension clinic and in 129 elderly patients on admission to and on discharge from (n = 100) an acute elderly patient assessment unit.

The results show that 88% of outpatients, 40% of elderly admissions, and 41% of elderly discharges knew the indications for their therapy; whilst only 40% of outpatients, 8% of elderly admissions and 12% of elderly discharges could name their medications. McCormack *et al*[8] also assessed the ability of doctors, nurses, young and elderly patients to spot the difference between commonly prescribed white tablets. Errors made by the

doctors were on 25% of occasions, nurses on 40% of occasions and patients on 61% of occasions, while young patients made errors 67% of the time and elderly patients 55% of the time. Based on these findings, they concluded that the results indicated that inpatients and outpatients, young as well as elderly have poor knowledge of their medications. Though patient knowledge of their dispensed drug dosage remains consistently higher in most studies 81% in Nepal [15]; 68% in Burkina Faso[18]; 83% in Botswana [5]; 80.8% in India [16]; 76% in Ghana [21], their ability to recall duration of treatment and purpose of dispensed drugs, however, were rather limited. Kiyingi [22] reported that patients had good knowledge of the dosage of their medications and how often to take these medications. They found, however, that patients were less knowledgeable about the timing of the medication and the total duration of the course of treatment. They also reported that patients had poor knowledge of the intended actions of the drugs and possible side-effects of the prescribed drugs. According to Kiyingi[22], 67% of the patients were literate; however, no correlation was found between literacy and knowledge of their drug regimens.

2.3. Dispensingtime

The mean dispensing time in most studies was short, ranging from 13 seconds in Nigeria [19] to 3.1 minutes in India [23]. Though there is no known gold standard for mean dispensing time, the WHO database for mean dispensing time is still rather limited. However, the data on medication dispensing time from different countries are increasing as more data are emerging from middle and low income countries (Table 1):

Table 1 Medication dispensing time from countries around the world

Country	**Average dispensing time**	**Reference**
Botswana	25 seconds	5
Nigeria	13 seconds	19
Tanzania	39.9 seconds	10
Cameroon	1.1 minutes	24
Saudi Arabia	30.1 seconds	25
Bangladesh	23 seconds	26
India	3.1minutes	23
Ghana	125 seconds	21
Nepal	86 seconds	27
China	16 seconds	27
Ethiopia	130.2 seconds	28
Malawi	58.4 seconds	29

From studies reported above (Table1), medication dispensing time in countries like Nigeria, Botswana, Saudi Arabia, China and Bangladesh are low (confounding factors such as language of communication and number of drugs on prescription sheet not withstanding) when compared with reports from countries like Cameroon, India , Ghana and Tanzania with much higher dispensing time. One of the limitations of studies that reported medication dispensing time is that none has so far suggested what should be the gold standard for dispensing

time [9]. [5] however, consider their dispensing time of 25 seconds as too short to allow for optimal dispensing information to the patient. In addition, they suggested that high values of dispensing time do not give much information, but low values may indicate a problem in the dispensing process. However, the cut off point for low dispensing time is what they failed to establish. The implication of this is that, to date, conclusion on what is 'short dispensing' time cannot be drawn.

[5] suggested that if dispensing time is increased, patients may receive adequate knowledge about their drugs which may help to improve their adherence to treatment. [26] in a study conducted in Bangladesh reported that dispensing time of 23 seconds and patient knowledge of their drug dosage of 55% is poor. The quality of dispensing instruction is equally very important, meaning that increasing dispensing time alone may not always result in improved patient knowledge of their dispensed drugs. Countries with short dispensing time are more likely to have patient population with poor knowledge of dispensed drug and possibly poor compliance to treatment [26]. WHO Regional Office for Western Pacific [27] stated that "Studies and publications from many developing countries indicate that both average consulting and dispensing times are far too short to lead to proper diagnoses and delivery of relevant information to patients that will ensure appropriate usage of medicines".

2.4. Present study

Overall patient knowledge of dispensed drugs in Gambia is not known. This study is of public health importance as it may highlight the need for greater attention on patient education for prescribed drugs in order to facilitate adherence. To a large extent it is anticipated that this study will generate data that would contribute to the improvement of the entire country pharmacy policy with regards to patient knowledge of their dispensed drug and its implication for patient drug safety.

The aim of the study is to assess patients' knowledge of their dispensed drugs and the relationships between that knowledge and patient characteristics.

. The main objectives are:

1. To explore the levels of patient knowledge in terms of dosage, duration of treatment and purpose of their prescribed medication immediately after dispensing by the pharmacist.
2. Examine the mean dispensing time at the Basse Health Centre Pharmacy (Basse Health Centre is a main referral centre for the region).
3. Explore the effect of other factors (including age, sex, patient literacy level, number of drugs dispensed, and mean dispensing time)on level of patient knowledge.

2.5. Research Questions

Is patient knowledge of their prescribed drugs associated with factors (like patient characteristics and dispensing time) in the health care setting?

3. Methods

3.1. Study design: This is a cross-sectional survey using a modified version of the WHO standard Questionnaire19 to collect data on patient recall of drug dosage, duration of treatment and purpose of dispensed medication, in order to determine their overall patient knowledge of their dispensed medication in rural Gambia. A closed-ended and structured questionnaire was used to interview the participants on their knowledge of dispensed medications.

The questionnaire was closed-ended and structured to ensure consistency in the range of answers from the patients and for ease of analysis. This is considered best for this study because it minimizes interviewer bias that is more common with open questions.30

3.2. Setting: This study was conducted at the out-patient pharmacy department of Basse Major Health Centre, Upper River Region (URR), The Gambia. Basse Health Centre is a major health centre serving as a first level referral health facility for eight minor health centres. The population of URR is about 183,000 people. The Health Centre attends to approximately 43,392 adult patients per year, with overall staff strength of 89 (including doctors, nurses, and other paramedical staff)

3.3. Sample size*:* Sample size was based on the average number of adult participants presenting to the pharmacy per month (3,616 participants) (Obtained from Basse Health Centre Records). Patients' information for a 3-month period (September 2010 to November 2010) were collected giving a total patient size of 10,848 for this time period. Estimates based on results from a previous study carried out in Burkina Faso (a developing country) where Krause*et al*18 found that 68% of participants were able to recall drug dosage. Assuming a level of confidence at 95% and an accepted error of 5%, the sample size required for this study was determined to be 335 participants. Sample size was calculated using the equation:

$n= (1.96^2)*pq/(d^2)$, where p=0.68 (percentage of participants able to recall drug dosage), q=1-p and d=0.05 (margin of error).

3.4. Ethical Approval

Ethical approval was given by the joint Gambia Government/Medical Research Council Scientific Coordinating Committee and the University of Liverpool Ethics Committee. The Regional Health Team that oversees Basse Health Centre approved the conduct of this study using the centre. Verbal informed consent was obtained from all eligible patients, each giving unique enrollment number. Patients' names were not collected to ensure anonymity and confidentiality. Verbal informed consent approach was chosen because the study does not require any invasive procedure as seen in experimental trials.

3.5. Participants

Patients at the out-patient department were approached by the project Field Assistant soon after they are out of the consulting room and invited to participate in the study following brief introduction of the research project to

them. As part of the introduction, potential participants were informed that there was a project going on at the pharmacy department focused on interviewing them about their dispensed medication and that their participation was voluntary. In addition, the potential participants were also informed that there was a study nurse stationed near the pharmacy who would ask them some questions. The field worker issued eligibility screening paper to those interested and directed them to the second field assistant who immediately determine the dispensing time and ushered the patient to the study nurse for the interview using the questionnaire following a thorough informed consent process. A total of 338 patients were interviewed. One patient refused participation on grounds that she is already participating in another research study. One questionnaire was rejected during data cleaning process because it was incomplete.

336 patients (males and females) aged 18 years and over, resident in URR of The Gambia who gave informed consent participated in this study. The study however, excluded patients less than 18 years and those who failed to give consent. Also excluded are psychiatric patients presenting with prescription sheet with diagnosis such as schizophrenia, mania, depressive illness or psychosis. Patients whose prescription drugs were not available at the pharmacy were also excluded from the study (i.e. those that do not have any of their prescribed drugs dispensed because the drugs are not available and are asked to go to outside patent medicine store to make purchase).

3.6. Procedure

Dispensing time was recorded (in seconds) by a trained field worker using a stop-watch for each patient (taken from the time the patient hands their prescription to the pharmacist to the time the last drugs are handed over to the patient). The field worker stood outside the pharmacy at a distance where s/he could have a clear view of the patient interaction with the pharmacist (a distance close enough to hear the content of the dispensing instruction) but away from the direct view of the dispenser while recording the dispensing time. A slip showing dispensing time and all the eligibility criteria were given to each patient as they make their way from the dispensing counter. Those who were eligible but had none of their drugs dispensed due to unavailability were excluded from further consenting and interview. Participants who fitted the eligibility criteria and provided consent were interviewed consecutively using a modified version of the standard questionnaire developed by WHO/DAP[19]. The questionnaire was structured and closed-ended to ensure consistency in the answers as well as ease of analysis. It was pilot tested on three patients for face validity. Interviews were conducted by trained nurses immediately after dispensing in the language that the participants can understand. Patient responses were assessed based on their knowledge of dosage, duration of treatment and purpose for each prescribed drug. Patient responses were scored as ‘1’ for any correct answer ‘0’ for an incorrect response / not sure. On the questionnaire patient’s study number, age group, sex, village code, level of education and list of all medications were included. The study nurse listed all prescribed drugs in a space provided at the end of the questionnaire for the purpose of determining the five most prescribed drugs at Basse Health Centre at the time of this study. Patient name and address were not captured on the questionnaire to maintain confidentiality.Verbal Informed consent was obtained from each participant (18 years and above) prior to taking part in the study. Each participant was given a copy of the Arabic version of the information sheet tailored to meet the needs of each of the three main local languages namely Mandinka, Fula and Sarahuleh. These Arabic-based local language

translated information sheets were back translated prior to the start of the project. Participants categorized as having incorrect knowledge of the drug dosage, duration of treatment and purpose of prescribed drugs were taken through a process of detailed explanation by a trained nurse, who used a marker pen with bold writing on the dispensing bag to re-emphasize the dispensing details if the initial one was unclear.

3.7. Dataanalysis

Patient characteristics were summarized using descriptive statistics such as means and medians (including ranges) and frequencies and percentages as appropriate. Level of knowledge was determined by a total score (range of '0' to '3') for each drug based on patient's knowledge of dosage, duration of treatment and purpose of prescribed drug. Patient survey answers of 'not sure' was considered equivalent to 'no' or '0'. For analysis, outcome of 'good' (score of 2-3) versus 'poor' (score of 0-1) level of knowledge was used. Uni- and multivariate logistic regression was used to investigate potential predictors (including age, sex, patient literacy level (levels 1 to 5), number of drugs taken and mean dispensing time) of outcome (level of knowledge). The main outcome variable used for the logistics regression analysis was the total score coded for each drug as 1(good knowledge) and 0(poor knowledge). This was made possible because the questionnaire was designed to capture responses on patient knowledge of drug dosage, duration of treatment and purpose of drugs coded as 1(for any correct response) and '0' (for incorrect response). Predictor variables used in the regression analysis include patients age, sex and level of education. Results were presented as crude and adjusted odds ratios (including 95% confidence intervals), with Level of significance set at $p < 0.05$. Analysis was performed using SPSS version 19.0.

4. Results

4.1. Patientcharacteristics

Of the 336 patients interviewed just over half were between the ages of 18 to 30 years n=180(53%). Gender distribution shows 228(67.9%) were females and 103(30.7%) males, (5(1.4%) missing values). Overall, 135(40.2%) of the patients had no education, 128 (38.4%) had informal (quranic- non English) level of education, 23(6.8%) primary level education and 39(11.6%) of patients had secondary level of education. Only 8 (2.4%) of the study patients had post-secondary education (Table 2). Nearly 1% of the data 3 (0.9%) were missing for education (see table 2).

Table 2. Demographic characteristics of participants.

Characteristics	Participants (%) n=336
Age group	
18-30	180(53.6%)
31-43	64(19.0%)
44-56	47(14.0%)
57-69	29(8.6%)
>70	16(4.8%)
Gender (n=331)	

Male Female	103(31.1%) 228(68.9%)
Years of formal education(n=333) - Post-secondary - Secondary school - Primary school - Informal(quranic) - None	 8(2.4%) 39(11.7%) 23(6.9%) 128(38.4%) 135(40.5%)

Table 3. Patient knowledge of dispensed medication

(Total number of drug prescribed for 336 patients= 571)

Patient Knowledge	Number prescribed Drugs (%)
Dosage (n=571) Correct recall (1) Incorrect recall(0) **Duration of treatment (n=568)** Correct recall (1) Incorrect recall(0) **Purpose of treatment(n=568)** Correct recall (1) Incorrect recall(0) **Overall knowledge(n=568)** Good(1) Poor(0)	 345(60.4%) 226(39.6%) 31(5.4%) 540(94.6%) 98(17.2%) 473(82.8%) 92(16.1%) 479(83.9%)
Most prescribed drugs(n=571) - Analgesic - Antibiotics - Anti-hypertensive - Haematinics (oral iron) - Anti-malaria - All others(missing datainclusive)	 257(45.0%) 137(24.0%) 81(14.2%) 43((7.5%) 13(2.3%) 40(7.0%)

4.2. Dosage

Of the 571 responses from patient recall of their drug dosage, 344 (60.6%) recalled correctly for the dosage of their prescribed medication and 224(39.4%) gave incorrect response (figure 1.0).

4.3.Duration of treatment

There were 571 patient responses on their knowledge of the duration of treatment, but only 31(5.4%) could recall duration of treatment correctly, while 540(94.6%) responses were incorrect (figure 2.0).

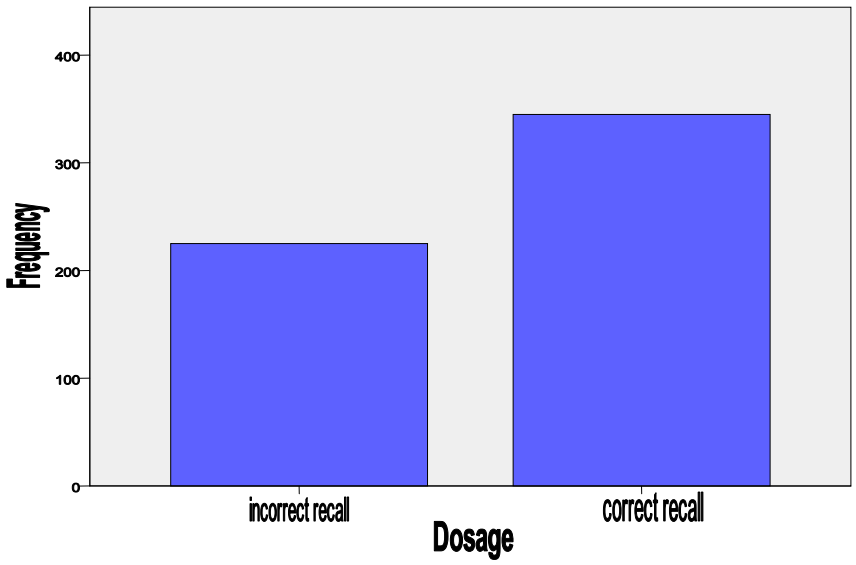

Figure 1 Patient knowledge of dispensed drug dosage

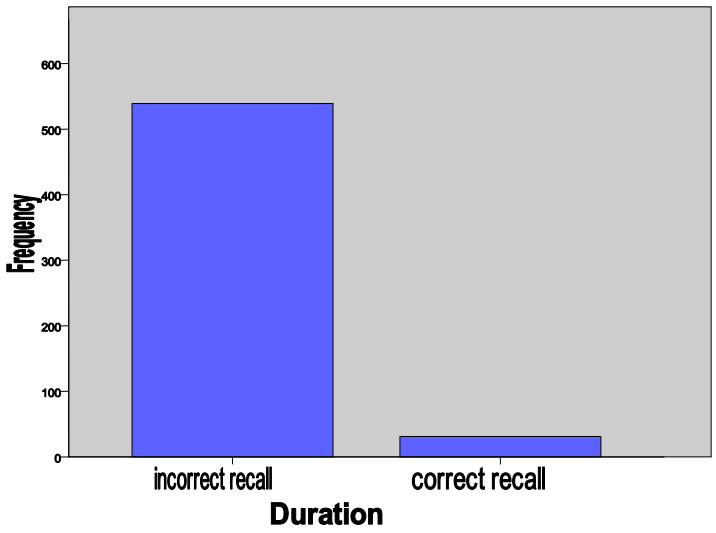

Figure 2 Patient knowledge of duration of treatment

4.4. Purpose of treatment

Of the 571 patient responses on the purpose for which medication were prescribed, 98(17.2%) could recall correctly the purpose of their dispensed drugs, while 473(82.8%) response were incorrect (figure 3.0).

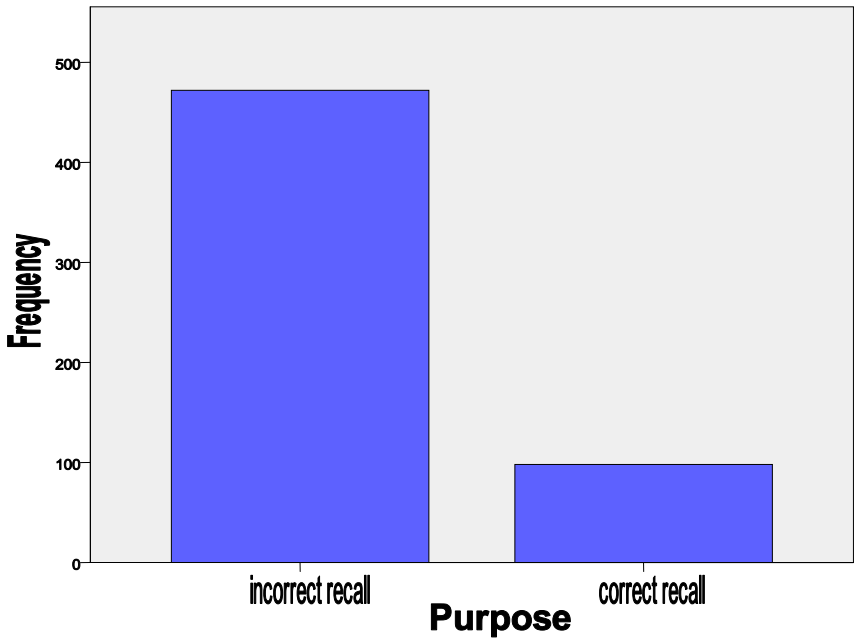

Figure 3 Patient Knowledge of purpose of treatment

4.5. Overall patient knowledge of their dispensed medication

Overall, only 92(16.1%) of patient had the predefined "good" levels of knowledge, while 479(83.9%) which constitute the vast majority of patient had "poor" knowledge of their dispensed drug in rural Gambia (Figure 4.0)

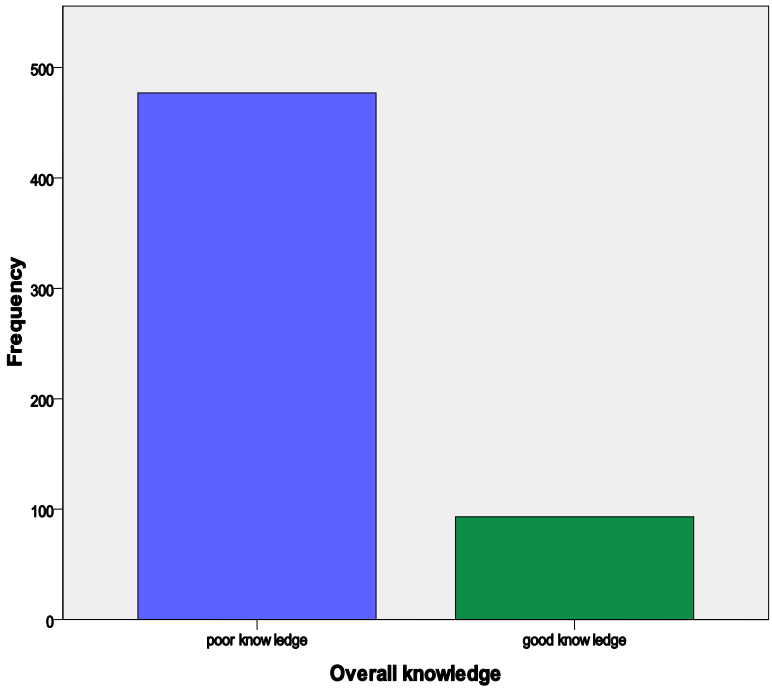

Figure 4 Overall patient knowledge of dispensed drug in rural Gambia

4.6. Mean score of the overall patient knowledge

The minimum score per dispensed drug would be 0 if all three responses for dosage, duration of treatment and purpose of treatment were wrong and the maximum score if all responses were correct is 3. The overall patient knowledge was defined as 'good' (score of 2 to 3) versus 'poor' (score of 0 or 1). Of the 336 patients, 265(78.9%) scored 0, 55 patients (16.4%) scored 1.0, 11 patients scored 2.0 and 5 patients scored 3.0. The mean score for overall patient knowledge of their dispensed medication is 0.27(SD = 0.596).

4.7. Dispensing time

The mean dispensing time at the Basse Major Health Centre pharmacy is 36.61 seconds (n=335) SD=15.837

The independent t-test for patient medication dispensing time in seconds and overall patient knowledge categorized as 'good' and 'poor' is 1.486(95% CI -2.010-14.20), p= 0.138. This result shows that dispensing time is not significantly associated with patient knowledge (p>0.05).

4.8. Predictors of patient level of knowledge

The variables age, sex and level of education were used as predictors for the dependent variable level of knowledge. The results are presented in Table 4.

Table 4 shows that the overall crude odds ratios for age, sex and education. The results were not statistically significant as all p-values are greater than 0.05, and hence all were poor predictors of patient knowledge based on the crude OR.

4.8.1. Age

The crude odds ratio for age group with independently significant p-value was obtained for age group 44-56([cOR 0.31, (95%CI 0.11-0.90,P=0.03), while adjusted odds ratio (aOR) for the same age group was 0.26, (95%CI 0.09-0.78,P=0.02)](Table 5.0).The adjusted OR for patient age group 18-30 is statistically significant(p=0.03). cOR and aOR for the other age groups were not statistically significant (p>0.05) (Tables 4.0 & 5.0). These results suggest that patient within 44-56 age bracket are better predictor of patient knowledge of their dispensed medication, the overall p-value for the cOR notwithstanding. However, the adjusted odds ratio for age as a predictor variable is statistically significant (p= 0.02) which suggest that age is a good predictor of patient knowledge of their dispensed medication.

4.8.2. Education

Primary school level of education [cOR 0.29, (95%CI 0.10-0.83,p=0.02) and ,aOR 0.15, (95%CI 0.05-0.47,P=0.001)](Tables 4.0 & 5.0). This suggests that primary level education is a predictor of patient knowledge. The adjusted odds ratio for education on a general note is statistically significant with overall p-value = 0.01.

Table 4 Crude odds ratio for predictor of main outcome (good versus poor patient knowledge)

Parameter	Reference category	Crudeodds ratio(cOR), 95%CI	p-value	Overall p-value per predictor variable
Age group				
18-30	18-30	0.58(0.31-1.07)	0.08	
31-43		0.69(0.36-1.32)	0.26	0.09
44-56		0.31(0.11-0.90)	0.03	
57-69		0.45(0.13-1.54)	0.20	
>70		NA		
Gender				
Male	Male			
Female		0.71(0.44-1.13)	0.15	0.15
Education				
None	None	0.65(0.39-1.06)	0.09	
Informal		0.79(0.33-1.89)	0.60	
Primary		0.29(0.10-0.83)	0.02	0.13
Secondary		0.99(0.20-4.81)	0.99	
Post-secondary		NA		

4.8.3. Gender

The crude and adjusted odds ratios for sex were 0.71(0.44-1.13), p=0.15 and 0.61(0.36-1.03), p=0.06 respectively. With p-values greater than 0.05, sex is not a predictor of patient knowledge. Overall p-values for gender as one of the predictor variables however suggests that gender is not a predictor of patient knowledge (see table 4 & 5).

4.9. Most prescribed drugs

The five most prescribed classes of drugs include:Analgesics 257(45.6%), Antibiotics 137(24.3%), Anti-hypertensive 81(14.4%), Haematinics (oral iron) 43(7.6) and Anti-malaria 13(2.3%). All other medications equal 40(7.0%). This result shows that analgesics constitute the most prescribed medication at the Basse health centre.

4.10. Average number of prescribed drugs

The average number of prescribed drugs (irrespective of generic name) per patient interviewed was 1.69 (min. =1, max.4), (SD= 0.800). This may suggest that polypharmacy is less likely at the Basse health centre.

Table 5 Adjusted odds ratio for predictor of main outcome (good versus poor patient knowledge)

Parameter	Reference category	Adjusted odds ratio(aOR)	p-value	Overall p-value per predictor variable
Age group				
18-30	18-30	0.48(0.25-0.90)	0.03	
31-43		0.54(0.28-1.07)	0.08	
44-56		0.26(0.09-0.78)	0.02	0.02
57-69		0.31(0.09-1.07)	0.07	
>70		NA		
Gender				
Male	Male	0.61(0.36-1.03)	0.06	0.06
Female				
Education				
None	None	0.51(0.30-0.86)	0.01	
Informal		0.53(0.21-1.32)	0.17	0.01
Primary		0.15(0.05-0.47)	0.00	
Secondary		0.87(0.16-4.78)	0.87	
Post secondary		NA		

5. Discussions

5.1. Level of knowledge of dispensed drugs

The results of this study indicate that the majority of patient's responses 479(83.9%) were categorized as having "poor" knowledge of dispensed drugs. The participants, however, had better knowledge of their drug dosage 345(60.4%) when compared to the knowledge about duration of treatment 31(5.4%) and purpose of dispensed drugs 98(17.2%). These results could be due to the labelling of the dispensing bag. More commonly seen is the hand written instruction on the medicine bag on how the medication should be taken as prescribed by the attending physician. Such level of labelling helps some patient to recall their medication dosage, hence the higher recall rate for dosage when compared with recall of duration of treatment and purpose of dispensed drugs. The latter two are entirely based on the quality of dispensing instruction and other patient's characteristics such as age, sex, number of prescribed drugs and level of education.

Patient recall of dispensed drug dosage of 60.4% is quite low when compared with similar work done in recent times, some of which include studies by [15] in Nepal where 81% of patient correctly recalled drug dosage, [5] in Botswana 83%, [18] in Burkina Faso 68% and Chedi, Abdu-Aguye and Kwanashie [31] in six hospital in the Northern Nigeria city of Kano where 80-95% of patients were able to recall their drug dosage correctly.

The poor knowledge found in the current study is a cause for concern as according to Kabira *et al*,[32] poor compliance is especially common when patients have poor knowledge, understanding, and perception of their treatment. Therefore this is the main reason why patients ought to be at their best in terms of understanding the details of medication instructions given by the dispenser.

The overall mean dispensing time for rural Gambia is short (37 seconds), a result similar to other studies which suggested that the mean dispensing time in most studies was short, ranging from 13 seconds in Nigeria [19] to 3.1 minutes in India [23]. [5] suggested that if dispensing time is increased, then patients may receive ample knowledge which may help to improve their adherence to treatment. Though adequate dispensing time has direct bearing with adequate patient knowledge of their dispensed medication, the quality of instruction from a well qualified pharmacist to the patient is equally important and must not be neglected. Dispensing time is a good indicator of the speed with which pharmacy technician attend to patients and in situation where it is short, patient are likely to leave the pharmacy with inadequate information about their drugs with a tendency towards poor compliance to treatment. According to [26] countries with short dispensing time are more likely to have patient population with poor knowledge of dispensed drug and possibly poor compliance to treatment. The method of dispensing time measurement used in this study is the same as used in other similar studies [5,26]. This approach is however; open to observer bias more so that the method cannot be entirely hidden from the dispenser who will be tempted to modify his or her behavior in the dispensing process.

5.2. Predictors of dispensed drug knowledge

The crude and adjusted odds ratios for sex were 0.71(0.44-1.13), p=0.15 and 0.61(0.36-1.03), p=0.06 respectively. With p-values greater than 0.05, gender is not a predictor of patient knowledge.

Patients' level of education and age are good predictors of patient knowledge of dispensed medication (p=0.01 aOR for education and p=0.02 aOR for patient age (Table 5.0). Patients within the age 44-56([cOR 0.31, (95%CI 0.11-0.90, P=0.03), adjusted odds (aOR) ratio for the same age group was 0.26, (95%CI 0.09-0.78, P=0.02)] (Table 5.0) are good predictor of patient knowledge. Patients within age group 18-30 are also good predictors of patient knowledge of dispensed medication (aOR 0.48, 95% CI 0.25-0.90, p=0.03). These results suggest that young and middle age brackets are good predictor of patient knowledge of dispensed medication.

The result shows that patient educational level is a good predictor of patient knowledge (overall p=0.01) (Table 5.0). Of all the levels of education, patient with no education and those with primary school level of education individually appear to be good predictors of patient knowledge compared to those with higher levels of education. Precisely, majority of the study participants have no formal education (none and informal–quranic education, 40.5% and 38.4% respectively). That is, about 78.9% of the participants had no formal education while the remaining 21.1% had some form of formal education. What this outcome revealed is that the study was conducted in a setting where the vast majority of people are uneducated and that formal level of education is not an absolute indicator of good patient knowledge of dispensed medication. However, it has been reported thatilliterate people are at the risk of inappropriate drug use,[33]a result that is contrary to findings in the present study where patients with no education were found to be good predictor of patient knowledge of

dispensed medication($p<0.05$). In a similar study by Kiyingi [22], 67% of the patients were literate; but, no correlation was found between literacy and knowledge of their drug regimens, which goes further to buttress the fact that educational level is not a good predictor of patient knowledge as discovered in the present study. In such setting where most patients had no formal education, it is therefore important to place more emphasis on the quality of dispensing instruction, relying more on the use of pictorial materials and clearly written instruction on the dispensing bags. In places where the vast majority of patients have no formal education as observed in this current study, ample dispensing time is required to ensure that the patient is well educated about his/her medication, though this will be a challenging goal for health facilities in developing countries where pharmacy departments are almost always crowded with patient each day. Therefore, in The Gambia, focus of future interventions to minimize dispensing error should be on quality of dispensing instruction.

In as much as dispensing instruction is very important as patients exit the health facility, the role of the prescriber cannot be over looked as they constitute the group of health care workers who tend to spend more time with the patient than the pharmacy technician. One of the roles of the prescriber is to educate patients about their conditions including name, duration, purpose and side effect of all medication. Studies have shown that the most frequently cited provider of medication information to patients were physicians [34,35]. This again is not common in most health facilities in developing countries where consultation time is equally short, mostly as a result of high patient turn over compelling the few available qualified health workers to work at fast rate, hence inadequate time to educate the patients as required, giving room to more medication dispensing errors [36]. Overall, the dispensed medication information patients exit the health facility should not be that given by the pharmacy technician alone, but should be the product of all medication information from the prescriber in the consulting room and the dispenser at the pharmacy.

Other important factors that may influence the level of patient knowledge of their dispensed drugs that are often over looked include:

1. Level of training of the dispenser
2. Number of staff on duty at the health facility pharmacy
3. Language barrier

Trained and experienced dispensers have been reported to pass across higher quality medication information to patients when compared to those who are untrained. According to [5], “only trained dispensing staff provided satisfactory quality of drug labelling and imparted the patients with satisfactory level of knowledge of their dispensed medication when compared with untrained staff as demonstrated by the higher mean knowledge scores.” The author therefore stated that “we believe that the level of training of prescribers is one of the main determinants of patient knowledge of drugs.” In the present study, whether the dispensers were trained or untrained was not recorded.

In many developing countries, shortage of qualified health workers is fast becoming a common phenomenon as a result of brain drain [37] and qualified pharmacist who should be directly responsible for the training of dispensers are no exception to this serious global problem. Between 23 to 28% of international medical graduate

migrates to The United States, United Kingdom, Canada or Australia. It is estimated that between 40 to75 percent of international medical graduates working in these countries are from lower-income/developing countries[38]. To overcome this challenge, low income countries will need to improve the remuneration of their health care professionals so as to retain them since they are largely responsible for the training of other medical/paramedical staff. The importance of having adequate number of trained dispensers in health facilities of low income countries cannot be over emphasized, as this has direct bearing on the quality of dispensing instructions that patients are expected to go home with. The more the number of trained dispensers working in the pharmacy simultaneously, the fewer the number of patient to be attended to by each dispenser and the more time he or she is likely to spend with each patient. Language barrier is another factor that is often taken for granted when addressing the quality of dispensing instruction in a very busy pharmacy, particularly in settings where language of communication are many and the pharmacy technician has mastery of only few. The Gambia, like any other developing country in Africa is faced with over burdened health facilities with very busy and overcrowded pharmacy, enough to influence the speed with which patients are attended to. It suffices to state that, a busy pharmacy technician with a crowd of patients to dispense drugs runs the risk of error in the dispensing process. Some of the errors may include wrong labelling of drugs, dispensing of wrong drug, inadequate drug administration instruction and poor information on drug side effect. These are the kind of errors in dispensing procedure that could contribute significantly to poor compliance. Though beyond the scope of this study, but worth mentioning is the concept of patient safety. Our findings of poor patient recall of dosage, duration of treatment and purpose of dispensed drug may result in poor adherence to treatment, a very important patient safety issue.

The recent call by the WHO regional director for Africa on all Africa nations to give priority to patient safety cannot be over emphasized as this is a strong reflection of the state of patient safety in the region when compared with what is obtainable in industrialized countries. Focus on patient education on how to minimize medication error is still grossly inadequate in the African region. In the USA for instance, though medication error is still problematic, tremendous advances has been achieved in patient education about their medication as shown in the following excerpt from the centre for disease control :

"Medicine cures infectious diseases, prevent problems from chronic diseases, and ease pain. But medicines can also cause harmful reactions if not used correctly. Errors can happen in the hospital, at the doctor's office, at the pharmacy, or at home [39].

Patient education at the level shown in the above excerpt can only be achieved in settings where patient consultation and dispensing time is adequate allowing patient the opportunity to ask important questions about their medication before leaving the health facility. Adequate patient education of their dispensed medication in developing country where dispensing time is short is still far-fetched, as more patient are harmed following medication error, hence the need for more national and international focus on patient safety [40].

5.3. Test of association

The result from the test of association suggest that there is association between patient knowledge of dispensed medication and the number of prescribed drugs (Fisher's exact test 24.703, p= 0.001). There is also association between gender and patient knowledge (Fisher's exact test 10.411, p=0.037). On the other hand, patient level of education and age group did not show any association with patient knowledge of dispensed medication (p>0.05). These results suggest that age and patient educational level are not good determinants of how well a patient understands the information they were given during the dispensing process.

5.4. Most prescribed drugs

The top three most prescribed drugs at Basse Health Centre include: analgesic, antibiotics and anti-hypertensive. This may be a reflection of the disease burden at the time of survey, as excessive use of analgesics, antibiotic and anti-hypertensive could mean that they are many cases requiring pain relieving remedies, infectious diseases and hypertension respectively in the community. Of all prescription encountered in this study, 24.3% were antibiotics, second only to analgesics which accounted for 45.6%. This result is similar to that in a study in Nigeria where it was reported that the most prescribed drug was analgesic followed closely by antibiotics prescribed for about a third of the patients[41]. This may be as a result of high rate of infectious diseases.

5.5. Average number of prescribed drugs

The average number of prescribed drugs (irrespective of generic name) per patient interviewed was 1.69 (min. =1, max.4), (SD= 0.800). This result suggests that polypharmacy is not a major problem at the health centre where the average number of prescribed medications is less than 2 when compared to a report from a study in Western Nigeria where the average number of prescribed drugs was 2.987±1.470[42]. The two common definitions of polypharmacy are: (1) a medication that is not matching a diagnosis and (2) That which emphasis is placed on a numeric value of 6 or more medications as constituting polypharmacy, the former being the most common definition[43].

5.6. Strength and limitations

One limitation of this study was the presence of the observer which could result in pharmacy technicians' behavior modification. This was minimized by ensuring that the pharmacy technicians are not aware of the aims and objectives of the study. Observer bias was further minimized by ensuring that the dispensing time and other activities of the research team were given some degree of privacy from the direct view of the dispensing pharmacy team. Minimal contact between the research team and the health centre pharmacy team as well as between patients already interviewed and the pharmacy team was encouraged throughout the study period.Another limitation of the study was in the area of quality of dispensing procedures, particularly the quality of dispensing instruction from the physician and the pharmacy technicians. The final information patients exit the pharmacy department should be a product of all medication education information from the physician's office and that from the pharmacist. This study would have been more robust if this aspect was explored. The exact level of training and experience of the pharmacy technician at the Basse Health Centre was

not examined. The pharmacy staff turn-over during the survey was also not determined, even though it was known prior to the study that the pharmacy department had trained technicians that work regularly. No new or less qualified staff was posted to the department during the survey. This notwithstanding, it would have been more robust to document periodically the technicians that were on duty all through the period of the survey to safeguard against unexpected posting. The main strength of the study was that it was well focused on establishing the level of information patient exit the health centre with. As an exit interview, it gives an overall assessment of the health facility performance in patient education and safety.It is possible to carry out this study using the interpretative approaches through focus group discussion, but this is highly limited as it is only able to project the patient world view about the dispensing process, but unable to give objective and quantifiable information that can be used for policy change, and planning of health systems for better patient education in relation to the population. The strength and limitation of this study is fairly similar to that of Boonstra *et al*[5] in Botswana, in which they stated that observer bias was a major limitation they tried to circumvent by unscheduled visit to study sites and non-interference by the research team on the consulting and dispensing procedures. However, their study had more strength because they went further to investigate the quality of dispensing process.

5.7. Conclusion

The overall patient knowledge of their dispensed drugs in rural Gambia is very poor and this has implications for treatment compliance and outcome as well as cost in a resource poor setting. Patients' age and level of education are good predictors of patient knowledge of their dispensed medications in rural Gambia. The dispensed medication information patients exit the health facility should not be exclusively reserved for the pharmacy technician alone; it should rather be the product of all medication information from the prescriber in the consulting room and the dispenser at the pharmacy.

5.8. Recommendations for practice

Dispensers need to spend more time with patient to ensure that the patients are well educated about their medication before leaving the pharmacy. The very poor patient knowledge of the purpose and duration of dispensed medication in this study calls for more patient education, and ample time to do so is highly recommended. The information patient exit the pharmacy should be the product of information from the prescriber and the dispensers as this may improve the quality of information the patients take home for better adherence to treatment. The number of trained dispensers should be increased for better patient-dispenser interaction. The use of pictorial tools will further improve patient ability to recall the dosage of their dispensed medication. This is of utmost importance in communities where the vast majority of patients lack formal education as discovered in this current study.

5.9. Recommendations for future research

A large scale national cross-sectional survey of patient knowledge of their dispensed drugs and quality of dispensing procedure in both urban and rural setting will go a long way in giving a more conclusive picture of

patient knowledge of their drugs in The Gambia. The relationship between dispensing information and adherence to the prescribed drugs would also be useful. Further studies are needed to investigate the quality of dispensing instruction and what may be considered the optimal dispensing time. Other possible and relevant future studies that could generate information that can shape research work on patient knowledge of dispensed drugs include:

1. Role of hearing impairment on dispensing instruction
2. Study to assess the effect of language barrier on the level of patient knowledge.
3. Training of dispensers- (meaning what training they have had.)

6. Implication for public health practice

Considering the poor level of patient knowledge of their dispensed medication in an isolated location in The Gambia, it is important that more emphasis be placed on providing adequate patient education during medication dispensing process with introduction of strategies that will enhance better patient knowledge of their dispensed drugs before leaving the pharmacy. The use of pictorial tools in settings where the vast majority of the population do not have formal education may be helpful. The overall patient knowledge of their dispensed medication in this study is very poor, a serious patient safety issue whereby patient may become prone to poor adherence to their treatment and errors that could be life threatening. Poor adherence could result in poor treatment outcome and increased cost of treatment as patient will have to return to the hospital a second time. The cost implication of poor adherence to treatment will be avoided.

Acknowledgments

We would like to thank all the study participants, the staff of Basse Health Centre and the Medical Research Council for their role in this work. Our immense gratitude goes to the Regional Health Team (RHT) and the Officer in-charge of Basse Health Centre for their unflinching support throughout the study.

Competing interests*:* All authors declare that there is no competing interest in the submitted work.

Funding: This is a self-funded work by the corresponding author.

References:

[1] WHO. Global Priorities for Patient Safety Research: Better knowledge for safer care- advocacy booklet, 2009. Available at: http://whqlibdoc.who.int/publications/2009/9789241598620_eng.pdf. Accessed 11/04/10

[2] VA Center for Medication Safety and VHA Pharmacy Benefits Management Strategic Healthcare Group and the Medical Advisory Panel. Adverse Drug Events, Adverse Drug Reactions and Medication Errors: Frequently Asked Questions, November 2006. Available at: http://www.pbm.va.gov/vacenterformedicationsafety/tools/AdverseDrugReaction.pdf.

[3] J.B Ndihokubwayo. WHO technical report: what Africa should do to improve patient safety- Dr

Sambo,Yaoundé, 2 September 2008. Available at http://www.afro.who.int/en/media-centre/pressreleases/item/678-what-africa-should-do-to-improve-patient-safety-%E2%80%93-dr-sambo.html.

[4] A.A.Tânia, P.Edson, B.R.Mário and C.C.Cibele. Medication errors and drug-dispensing systems in a hospital pharmacy. *Clinics* vol.60 no.4 São Paulo Aug. 2005. Available at: http://dx.doi.org/10.1590/S1807-59322005000400011. Accessed 06/12/2011.

[5] E.Boonstra, M. Lindbaek, E. Ngome, K.Tshukudu, P. Fugelli. Labelling and patient knowledge of dispensed drugs as quality indicators in primary care in Botswana. *Qual Saf Health Care* 2003; 12:168-175. Available at: http://qshc.bmj.com/content/12/3/168.full. Accessed 24/03/10

[6] D.L.Gruppo. The knowledge of patients on the drug therapies at discharge. *Assist Inferm Ric* 2009 Oct-Dec; 28(4):176-82. Abstract. Available at: http://hinari-gw.who.int/whalecomwww.ncbi.nlm.nih.gov/whalecom0/pubmed/20222518. Accessed 10/05/10.

[7] A. Garjani,M. Rahbar, T. Ghafourian ,N. Maleki,A.F. Garjani, M. Salimnejad,*et al.* Relationship of pharmacist interaction with patient knowledge of dispensed drugs and patient satisfaction *Eastern Mediterranean Health Journal*, 2009 Vol. 15, No. 4.

[8] P.M.McCormark, R. Lawlor, C. Donegan, D. O'Neill, S. Smith, C. Moroney,*et al.* Knowledge and attitudes to prescribed drugs in young and elderly patients. *Ir Med J*. 1997 Jan-Feb;90(1):29-30.

[9] A.Y. Massele, and S.E.D. Nsimba. Comparison of drug utilization in public and private PHC clinic in Tanzania; in Massle AY, Nsimba SED, Rimoy G. Prescribing habit in Church-owned primay health care facilities in Der es salam, Tanzania and other Tanzania coast regions. *East Africa Medical Journal*, 2001 vol.78 No. 10.

[10] A.Y.Massle, S.E.D. Nsimba, and G. Rimoy. Prescribing habit in Church-owned primay health care facilities in Der es salam, Tanzania and other Tanzania coast regions. *East Africa Medical Journal*, 2001 vol.78 No.

[11] WHO. What are the health risks related to overcrowding? 2012 Available at: http://www.who.int/water_sanitation_health/emergencies/qa/emergencies_qa9/en/index.html. Accessed 3/01/2012.

[12] D.J.P.Williams. Medication errors.*R Coll Physicians Edinb* 2007; 37:343–346.

[13] O.K. Lebitsa, J. Kgattlwane, V. Sebako. Report on the Botswana drug use indicator study of 1997, in: E. Boonstra, M. Lindbaek, E. Ngome, K.Tshukudu and P. Fugelli. Labelling and patient knowledge of dispensed drugs as quality indicators in primary care in Botswana. *Qual Saf Health Care* 2003; 12:168-175. Available at: http://qshc.bmj.com/content/12/3/168.full. Accessed 24/03/10

[14] O.K. Lebitsa, J. Kgattlwane, V. Sebako. Report on the Botswana drug use indicator study of 1997. Gaborone: Ministry of Health, 1997.

[15] S. Ghimire, S. Nepal, S.Bhandari,P. Nepal, S. Palaian. A prospective surveillance of drug prescribing and dispensing in a teaching hospital in western Nepal. *J Pak Med Assoc*. 2009 Oct; 59(10): 726-31.Available at: http://hinari-gw.who.int/whalecomwww.ncbi.nlm.nih.gov/whalecom0/pubmed/19813695. Accessed 08/05/10

[16] S. Karande, P. Sankhe, M. Kulkarni. Patterns of prescription and drug dispensing. *Indian J Pediatr* 2005; 72: 117-22.

[17] L. Sutharson, R.S. Hariharan, C. Vamsadhara. Drug utilization study in diabetology outpatient setting of a tertiary hospital. *Indian J Pharmacol* 2003; 35:237-40.

[18] G. Krause, J. Benzler, R. Heimuller,M. Borchert, E. Koob, K. Ouattara, *et al*.Research report. Performance of village pharmacies and patient compliance after implementation of an essential drug programme in rural Burkina Faso. *Health Policy and Planning* 1998; Vol 13, 159-166. Available at: http://heapol.oxfordjournals.org/cgi/content/abstract/13/2/159. Accessed 10/05/107.

[19] World Health Organization/ Action Programme on Essential Drugs (WHO/DAP).How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators- *EDM Research Series* No 007 (1993; 92 pages). Available at: http://apps.who.int/medicinedocs/en/d/Js2289e/8.3.html#Js2289e.8.3. Accessed 09/05/10

[20] A.M. Husayn andG.S David. Medicine in the Elderly: How much can elderly patients tell us about their medications? *Postgrad Med J* I990; 66, 116- 121. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2429534/pdf/postmedj00158-0043.pdf. Accessed 04/06/10

[21] M. Ameyaw and D. Ofori-Adjei. The impact of three forms of educational interventions on dispensing practices. Available at: http://archives.who.int/prduc2004/rducd/ICIUM_Posters/2b1_txt1.htm. Accessed 30/01/2012.

[22] K.S. Kiyingi. How much do outpatients know about drugs prescribed to them? A pilot study. *P N G Med J*. 1993 Mar; 36(1):29-32. Abstract available at: http://hinari-gw.who.int/whalecomwww.ncbi.nlm.nih.gov/whalecom0/pubmed/8266730. Accessed 22/09/10

[23] A. Hazra, S.K. Tripathi and M.S Alam. Prescribing and dispensing activities at the health facilities of a non-governmental organization. *Natl Med J India* 2000 Jul-Aug; 13(4):177-82. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11002683. Accessed 08/05/10.

[24] WHO. Promoting appropriate drug use in missionary health facilities in Cameroon: Essential Medicines and Health Products Information Portal. A World Health Organization resource, 1998. Available at: http://apps.who.int/medicinedocs/en/d/Js2238e/

[25] J. Emmanuel, A. Khalid, H.Z.Annas and M.I.A. Omer. Factors influencing rational drug use in primary health care centres in Qassim Region, Saudi Arabia. *Saudi Pharmaceutical Journal*, Vol 11, No.3, July 2003. Available at: http://faculty.ksu.edu.sa/hisham/Documents/SPJ/110307.pdf

[26] A.B. Guyon, A. Barman, J.U. Ahmed and M.I.A.Omer. A baseline survey on use of drugs at the primary health care level in Bangladesh. Bulletin of the World Health Organization, 1994 Available at: http://www.ncbi.nhm.nih.gov/pmc/articles. Accessed 16/01/2012

[27] WHO Regional Office for the Western Pacific. Essential Drugs and Medicine Policy Access to quality essential medicines is the right of every patient.*ISSUE NUMBER III (1)* 2004. Available at: http://www.wpro.who.int/NR/rdonlyres/8F9F8200-E42B-46E5-BF75-C0DE82E77E3E/0/EDMP_Jun04.pdf. Accessed 22/01/2012

[28] Y. Hawi, T. Shibiru and T.W. Nasir. Labeling and patient knowledge of dispensed drugs in tertiary care university hospital in south west Ethiopia, 2009.

[29] A.G. Sosola. An Assessment of Prescribing and Dispensing Practices in Public Health Facilities of Southern Malawi, 2007. Dissertation Submitted in Partial Fulfillment of the Requirements of the

Master of Public Health Degree.

[30] Nigel B, Daniel P, Debbi S. Quantitative methods for health research, 2008 p. 3, 5 &165

[31] B. A. Z.Chedi, I. Abdu-Aguye andH.O Kwanashie. Analysis of patient care and facility indicators in public health institutions in Kano state, Nigeria. *Nigerian Journal of Pharmaceutical Sciences* Vol. 8, No. 2, October, 2009, ISSN: 0189-823X.

[32] M. Kabira, Z. Iliyasu, I.S. Abubakaraand M. Jibril. Compliance to medication among hypertensive patients in Murtala Mohammed Specialist Hospital, Kano, Nigeria. *Journal of Community Medicine & Primary Health Care*. 2004; 16 (1) 16-20. Available at:http://ajol.info/index.php/jcmphc/article/viewFile/32401/6069.

[33] M.M. Daghio, G. Fattor, A.V. Ciardullo. Use of pictorial advice to promote compliance to diet and drugs among illiterate and migrant patients. *The Journal of the Diabetes in Asia Study Group*, 2011. Available at: http://journalofdiabetology.org/Pages/Releases/FullTexts/ThirdIssue/SC-1-JOD-10-015.aspx. Accessed 17/07/2012.

[34] E. Al-Nsour, I. Al-Doghim, N. Al- Shamaeleh. Assessment of patient's knowledge on their chronic medications. *J. J. Appl. Sci*, 2007: Vol. 9, No. 1, 1-6.

[35] E. Al-Nsour, I. Al-Doghim, A. Essalim and M. Hiary. Patients' knowledge about their medications during emergency visits.*JRMS* April 2008, 15(1): 45-50.

[36] T. Tinsy, D.A. Leelavathi,S. Venkatraghavan,P. Sureshwar, M. Rama. An observational study to evaluate the factors which influence the dispensing errors in the hospital pharmacy of a tertiary care hospital. *Journal of Clinical and Diagnostic Research* [serial online] 2011 November [cited: 2012 Jul 17]; 5:1214-1218.

[37] O.B. Paula and O.G. Lawrence. Health Worker Shortages and Global Justice. Milbank memorial fund, 2011. Available at: http://www.milbank.org/reports/HealthWorkerShortages_Mech/HealthWorkerShortages_Mech.html. Accessed 18/07/201212.

[38] M.M.D. Fitzhugh. The Metrics of the Physician Brain Drain. *N Engl J Med* 2005; 353:1810-8.

[39] Centre for disease control (n.d) Medicine Plus: A trusted health information for you. National Institute of health (NIH). Available at: http://www.nlm.nih.gov/medlineplus/medicationerrors.html. Accessed 02/12/2010.

[40] WHO. 10 Facts on patient safety, 2011. Available at: http://www.who.int/features/factfiles/patient_safety/en/index.html. Accessed 28/01/2011

[41] T.M. Akande andM.O. Ologe. Prescription pattern at a secondary health care facility in Ilorin, Nigeria. *Ann Afr Med* 2007; 6:186-9.

[42] T.M. Akande, M. Ologe, G.F. Medubi. Antibiotic Prescription Pattern and Cost at University of Ilorin Teaching Hospital, Ilorin, Nigeria.International Journal of Tropical Medicine Year: 2009, Volume: 4, Issue: 2, Page No.: 50-54.

[43] L.B. Reamer, B.M. Emily,W.S. Temple, C.A. Jane and N. Kit. Polypharmacy: Misleading, but manageable.*Clin Interv Aging*. 2008 June; 3(2): 383–389.