DISPENSING AND QUALITY OF AMOXYCILLIN PREPARATIONS IN RETAIL PHARMACIES ON TANZANIA MARKET

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Summary

A study on dispensing practice and quality of amoxycillin capsules and syrups was conducted in retail pharmacies in 5 regions of Tanzania. Data on dispensing practice was collected by interviewing 75 dispensers through structured questionnaires. Quality of amoxycillin capsule formulations and dry powder for suspension preparations from six different manufacturers was evaluated for chemical content at the Tanzania Food and Drug Authority (TFDA) in Dar es Salaam. The study showed that of all the dispensers only 17.3% were pharmacists, 21.3% pharmaceutical technicians and 28% were nurses of different ranks. Results indicated that the most dispensed amoxicyllin was the locally produced preparation which accounted for 41.3%. Affordability determined the most dispensed and lowest priced generic brand, amoxycillin by 68%. Results revealed that only 46.6% dispensers refused to dispense amoxycillin without a prescription while 53.4% dispensed. Out of the ones who dispensed, 42.5% gave patients the most expensive preparations and 22.5% just dispensed according to the patients' demands. Similarly patients with prescriptions written in a generic name, the dispensers (28%) issued them with the most expensive brand while others were issued the brand they specifically demanded by 32% of the dispensers. For patients who came to the pharmacy with less money, results revealed that 66.7% of the dispensers dispensed incomplete doses and then requested them to come back for the remainder and 13.3% just gave out incomplete doses without any further counseling. Responses regarding reconstitution of the dry powder for suspension showed that only 10.7% dispensers reconstituted before giving it out to patients and the rest just instructed patients on how to reconstitute at home. Further, 74.7% of dispensers instructed the patients to use teaspoons to measure 5ml of the suspension. The results from the assessment of chemical contents showed that all capsules and dry powder for suspensions complied with respect to pharmacopoeial limits. It is concluded that dispensers should continually undergo continuing education on good dispensing practices.

Key words: Amoxycillin, quality, dispenser, retail pharmacy

Introduction:

Pharmacists and other pharmaceutical personnel in retail pharmacies have the duty to directly influence the health of the patients through appropriate good pharmaceutical practice in dispensing and counseling patients.[1] Research information published to date has most focused on characterizing consumer behavior and drug utilization patterns.[2-4] However factors that are associated with the practices of pharmaceutical personnel in the pharmacies that may contribute to irrational dispensing have not received much attention. Amoxycillin is a semi-synthetic penicillin used in the management of infections caused by Gram-positive and Gram-negative bacteria. Infections treated by amoxicillin include pneumonia, urinary tract and soft tissue infections. It one of the antibiotics of choice by the Ministry of Health and Social Welfare (MOH) in Tanzania in the is treatment of urinary tract infections hence is widely used in the community. As a result of wide use, amoxycillin is prone to development of resistance. The underlying factors for emergence of resistance of amoxycillin include its use in under-therapeutic dosage, irrational prescribing and dispensing, and use of poor quality products.[5] In Tanzania, as elsewhere in developing countries, discussion of low quality of medicines often features in literature.

The issues of low quality medicines could result in development of drug resistance that can necessitate a change of treatment guideline.[6,7] The use of antibiotic preparations of poor quality could be a contributory factor of treatment failure. Research on quality of drugs in a neighboring country Kenya has revealed presence of poor quality penicillin products circulating on market.[7] The Ministry of Health and Social Welfare in Tanzania provides standard treatment guidelines that aims at providing all health providers with a set of guidelines to assist them in prescribing and dispensing medicines appropriately. This study presents findings on dispensing of amoxycillin preparations by pharmacists and other pharmaceutical personnel in retail pharmacies in five regions of Tanzania and quality of amoxycillin capsules and dry powder for suspensions found on market in the same regions.

Methodology:

Study design and area

This was a cross-sectional prospective study and was conducted in 75 retail pharmacies selected from five regions of Tanzania. Thirty-three pharmacies were located in Dar es salaam, 19 in Mwanza, 13 in Arusha, 7 in Kilimanjaro and 3 in Kagera. The regions were sampled through convenience while pharmacies were randomly selected. The data collector interviewed only one dispenser from each pharmacy.

Data collection

Structured questionnaires consisting of open and closed questions were used to collect information from the dispensers. Questionnaires were pre-tested before use to check the reliability and accuracy in data collection, and adjustment made accordingly. Before the interviews, informed consent from each respondent was sought. The filling of the questionnaires by respondents was done in the presence of a data collector. The questionnaires required all participants to indicate their academic qualifications and to mention the most dispensed amoxycillin preparation. Furthermore, interviews dealt with dispensers' responses to patients' prescriptions. Other set of questions in the questionnaires were looking at the practice of dispensing amoxycillin dry powder for suspensions

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Samples, reagents and instrumentation

Working standard of amoxycillin trihydrate with potency 99.8% manufactured by Shiba Pharma-Yemen was obtained from the TFDA. A total of 14 samples of which 9 were amoxycillin capsules and 5 dry powder for suspension were purchased from local pharmacies. These included sample A1 and A2 (capsules and powder) from a local pharmaceutical industry; sample B1 and B2 (capsules and powder) from a pharmaceutical company based in Kenya; sample C1 (capsules and powder) and C2 (capsules) from a pharmaceutical company based in United Kingdom; sample D (capsules) from a pharmaceutical industry in Cyprus, and samples E and F (capsules) from companies based in India. Distilled water was prepared in the laboratory using a water distiller (GFL-UK). Boric acid buffer (pH 9.0) was purchased from BDH Limited Poole- England. Acetic anhydride-dioxan solution (1ml of acetic anhydride to 50ml of 1,4-dioxan) was purchased from BDH Limited Poole-England. Imidazole-mercury reagent (PH 6.75 – 6.85) was purchased from BDH Limited Poole-England. Instruments that were used in the analysis included a UV-spectrophotometer (CECIL CE 3041 3000 Series-UK), analytical balance (WAGTECH, Model NO. WA210 1W REVB – UK), shaker (Stuart Scientific-UK), a sonicator beaker (WAGTECH, Model NO. 3210-UK) and filter papers (Whatman International Limited-England – NO.1).

Amoxycillin capsules

Powder equivalent to 200 mg amoxycillin accurately weighed was dissolved in 100ml of distilled water in a volumetric flask. Ten milliliters (10ml) of that solution was diluted to 100ml using distilled water. The amount of amoxycillin standard equivalent to amoxycillin 20mg was weighed and dissolved in 100ml of distilled water in a volumetric flask. The absorbance of the test and standard solutions was measured on UV- spectrophotometer at 270nm against a blank sample. The concentration of amoxycillin in the samples was calculated out from the one point calibration curve equivalent to 0.2g/l of amoxycillin. The calculations of concentrations were performed in accordance with the Beer Lamber's law using a validated method.

Amoxycillin powder for suspension

Amoxycillin powder for suspension from each preparation was reconstituted with distilled water, following the manufacturer's label instructions. Distilled water was added to a weighed quantity of the oral suspension containing the equivalent of 0.15g of amoxycillin to produce 500ml and was shaken for 30 minutes. The solution was then filtered, and 10ml of the filtrate was transferred to a 100ml volumetric flask. To this solution 10ml of boric acid buffer (pH 9.0) was added followed by 1ml of acetic anhydride dioxan solution. The resulting solution was allowed to stand for 5 minutes and sufficient distilled water was added to produce 100ml. Two quantities each of 2ml of the solution were placed separately in test tubes. To one test tube 10ml of imidazole–mercury reagent was added, mixed, stoppered and immersed in a water bath at 60^0C for exactly 25 minutes while swirling occasionally. The solution was removed from the water bath and cooled rapidly to 20^0C. To the second tube, 10ml of water was added and treated in a similar way as the first test tube. Absorbance of the two solutions was measured at the maximum 325nm without delay. The difference between the absorbance of the two solutions was utilized in the calculation of chemical content of amoxycillin of test samples as in the case of capsules.

Results and Discussion

This study has revealed that majority of dispensers in retail pharmacies are nurses and pharmaceutical technicians rather than pharmacists. Among all respondents, pharmacists were 17.3%, pharmaceutical technicians 21.3% and nurses 28%. The rest of respondents were clinical officers 13.3%, Pharmaceutical assistants 14.7%, medical doctors 2.7% and non-medical personnel 2.7%. These findings are similar to those reported in a previous study on the quality of pharmacy practice among dispensers in private pharmacies: a case study in Dar es Salaam where pharmacists accounted for 8.0% only [8]. It has been reported that in developing countries the number of pharmacists is low compared to the population and number of pharmacies served.[1,3] For these reasons it appears that the few pharmacists available assume other managerial and supervision responsibilities rather than dispensing at the counter. In any case the role of pharmacists in dispensing prescription medicines remains very crucial because they are the experts of drugs. Among the amoxycillin preparations that were encountered in this study sample (A), a locally produced medicine was found to be the most dispensed (41.3%) followed by sample (B), imported from Kenya. Of the most dispensed amoxycillin (sample A), 68% of the dispensers ranked it the most dispensed due to the number of patients that afforded to purchase it, while 28% was by patients without prescriptions and the rest because of frequency of prescriptions received from patients. Sample A was the cheapest generic brand in all regions surveyed. Variation of prices and affordability of medicine is currently a burning issue worldwide.[9,10] Prices of medicines vary between and within innovator brand and generic equivalents. Such variations arise because of the differences in mark-ups resulting from price components such as cost-insurance-freight (CIF) and taxing systems.[9] With a budgetary constraint a patient has to decide how to use his scarce resources in the most cost-effective way.[11]

In this study interviews on assessment of the practice of dispensers on handling patients seeking amoxycillin without prescriptions, results show that 53.4% dispensed without a prescription while the rest advised the patients to consult a prescriber first. Out of the ones that dispensed, 42.5% issued the most expensive generic brand they had in stock and about 35% dispensed the brand that was demanded by the patients. However 22.5% first found out how much the patient was prepared to spend before dispensing. In Tanzania as elsewhere in the developing countries self-medication is practiced [11-13]. Nevertheless the tendency of patients walking in the pharmacy and demanding to purchase a

particular medicine despite that the product is "a prescription or non-prescription" has been reported and is a common practice.[1,14] On the other hand, pharmaceutical personnel in private pharmacies around the world are constantly faced by dual roles; a professional and a business role.[11] Practicing rationally as "businessmen" they would maximize the sale of costly branded medicines that generate high profit. This practice was observed in this study in which majority of dispensers gave out the most expensive amoxycillin brand to the patients without prescriptions and those with prescriptions written with a generic name. The problem of issuing incomplete doses was also observed with patients who visited the pharmacy to purchase the medicine with less money. Results show that 66.7% dispensers dispensed incomplete doses though requesting patients to come back for the remaining doses. However about 13.3% of dispensers just dispensed incomplete doses without any further counseling while 20% did not dispense at all. Moreover, this study has revealed that most dispensers (80%) instructed patients who purchased amoxycillin dry powder for oral suspension on how to reconstitute it at home using boiled and cooled water and how to measure the 5ml of the suspensions. Regarding measuring 5 ml of the suspension 74.7% dispensers told patients to use a teaspoon. This practice is very common and Kabati *et al* (1998) in his study on variability in the volume of teaspoons demonstrated a volume range between 1.7-9.1 ml. From those results it was recommended that teaspoons available in homes are not suitable for measuring liquid preparation.[15]

For the 9 capsules and 5 dry powder for suspension samples for analysis, a total of nine and five chemical content tests were performed respectively as indicated in Table 1 and 2 of the results.

Table 1: Amoxycillin Content of Amoxycillin Capsules Products.

(N=9)

Sample Nr	Absorbance	Amoxycillin content (% label claim)
A_1	0.474	97.8
A_2	0.527	108.75
B_1	0.487	100.5
B_2	0.527	108.75
C_1	0.527	108.75
C_2	0.534	110.0
D	0.526	108.5
E	0.503	103.8
F	0.489	101.0

Key: λ = 270 nm. Limits for content of active ingredients 90 –120%.

Table2: Amoxycillin Content of Amoxycillin Oral Suspensions.

(N=5)

Sample Nr	Absorbance	Amoxycillin content (% label claim)
A_1	0.515	107.0
A_2	0.473	98.6
B_1	0.516	107.56
B_2	0.542	113.0
C	0.512	106.73

Key: λ = 325 nm. Limits for content of active ingredients of ammoxycillin suspensions is 80 –120%.

The assay tests of active ingredients in amoxycillin capsules and dry suspensions, results show that all 6 capsule samples and 3 dry suspension preparations passed the test with a limit of 90-120 % and 80-120% respectively, as specified by British Pharmacopoeia (BP)[16]. The observed results ensure that so far both locally manufactured and imported amoxycillin preparations are of good quality as far as chemical content is concerned. The method used is not stability indicating, it only assays total UV active content, whether it is a contribution of single component and/or degradation product cannot be ruled out. However, apart from the UV method, High-performance liquid chromatography could have been the most appropriate analytical method to use because of its ability to separate the parent drug from other impurities due to decomposition [17]. This method was not employed because some cost implications.

Conclusion

In conclusion this study has established that majority of dispensers in retail pharmacies are nurses and pharmaceutical technicians. Hence in most time, the observed dispensing practice reflect more on profit maximization than on "professional" role and this could be the reason of amoxycillin being dispensed without prescriptions in some pharmacies. Furthermore, the results showed that both locally and imported amoxycillin preparations circulating on Tanzania market so far are of good quality regarding chemical content. However these results should not discourage the continuing need for quality certification for products on market by reputable laboratories in the country because only few samples were tested in this study.

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