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COMMUNITY PHARMACISTS' INVOLVEMENT IN THE ORDERING AND INTERPRETATION OF LABORATORY TESTS

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ABSTRACT: The focus of this exploratory study was to determine if community pharmacists order laboratory tests, why they order the tests, type of tests they order and what they do with the outcome of such tests. Self-administered pre-tested 34-item semi-structured questionnaires were used to carry out this study among superintendent pharmacists' of registered pharmacy premises in two south-western states in Nigeria. Descriptive statistics (frequency and percentages), Mann-Whitney U and Kruskal-Wallis tests were used to appropriately summarize the data obtained. All the respondents who consented to take part had ordered laboratory tests for patients prior to this study. The types of invasive and non-invasive tests ordered, ranged from simple dipstick pregnancy test to more varied tests like: fasting blood glucose 24(36.9%), blood pressure measurement 58(89.2%), malaria parasite test 47(72.3%), full blood count 16(24.6%), widal reaction test 45(69.2%), urinalysis 10(15.4%) mantoux test 3(4.6%) and hepatitis B & C test 3(4.6%). Some of the perceived benefits derived from interpreting laboratory test results were patient trust and confidence in pharmacists 28(43.1%), job satisfaction and relevance to the community 8(12.3%) and revenue generation 5(7.7%). Community pharmacists in the two South-western states of Nigeria ordered various types of invasive and non-invasive laboratory tests and interpreted the outcomes of such tests either alone or in conjunction with physicians. This aspect of the pharmaceutical care continuum could be harnessed to foster the collaboration between pharmacists and physicians and ultimately improve patient care.

INTRODUCTION: Pharmaceutical care (PC) has been defined as the responsible provision of drug therapy for the purpose of achieving definitive outcomes that improves a patient's quality of life [1]. The components of pharmaceutical care that improves patients' quality of life are pharmacist-directed patient care services such as patient education, patient counselling, product -use demonstration, therapeutic drug monitoring, drug utilization review, medication therapy management and wellness management [2].

Though many of these services are rendered by pharmacists in the hospital and community settings; the responsible and effective provision of PC requires direct contact between the recipient (patient) and the provider (pharmacist).

Community pharmacists (CP) are oftentimes the first point of call for patients' complaints because of their proximity in the neighbourhood [3-6].

In order to implement a successful PC service, it was suggested that pharmacists may need to come up with new health care service [7, 8] which will benefit the populace and to this end community pharmacists have taken advantage of recent advances in laboratory technology [9] with the development of compact testing equipments that are easy to operate and are capable of producing accurate results.

The availability of these equipments have made it possible for many community pharmacists to use them in Point of Care Testing (POCT) to monitor patient's cholesterol level, blood glucose level, thyroid stimulating hormone (TSH) level, blood pressure and anticoagulant therapy [6, 10-14]. The ready availability of these POCT kits affords community pharmacists the opportunity to perform on-site laboratory services for patients [9].

Laboratory data are of value in rendering appropriate and adequate PC; it can assist in the diagnoses of various diseases, determination of dosage regimen for various age groups and the monitoring of serum concentration of drugs with narrow therapeutic window [9]. In community pharmacy settings, there is usually limited access to laboratory test results (LTRs) ordered by physicians, thus, ordering and performing selective laboratory tests (LTs) may be a way of accessing such scarce data in the community set-up [9].

A study showed that in Eritrea, Germany and Switzerland all community pharmacies perform blood pressure tests while in Germany, all community pharmacies perform urine tests [15]. According to this study invasive tests such as blood tests were only performed in six countries namely: Australia, Great Britain, Kenya, The Netherland, Switzerland and United States by specialized community pharmacies. There was no record of the type of tests performed in community pharmacies in Nigeria in this study.

There is a dearth of information in the literature on the types of LTs frequently ordered by community pharmacists in Nigeria. Hence the focus of this study was to determine if community pharmacists order LTs, why they order such tests, type of laboratory tests ordered and steps taken when the outcome of the tests were received.

MATERIALS AND METHODS: The study was carried out in two South-western states of Nigeria (Oyo and Osun) between April and October 2010. The two states were previously one, Oyo, before it was divided into two in 1991. These states were chosen because the socio-cultural and economic backgrounds of the inhabitants are similar.

The study was carried out strictly adhering to the principles outlined in the most recent amendment of Helsinki declaration of 1954 [16] and the study involved CPs who practiced in registered premises (duly registered with the regulatory body known as the Pharmacists' Council of Nigeria, PCN). A list of registered premises as at 31st December, 2009 obtained from the PCN had 40 registered premises in Oyo state and 28 in Osun state. Registered premises were used for this study because there had been a proliferation of pharmacies that were not duly registered with PCN and were been managed by pharmacists and non-pharmacists [17] while the law stipulated that a registered pharmacist who in this case is the superintendent pharmacists must be in continuous control of the activities in the pharmacy premise [18]. Because the number of registered premises in both states as at 31st December, 2009 was small the entire population was considered for this study.

Superintendent pharmacists were the ones allowed to fill the questionnaires, other pharmacists when applicable were not allowed to fill the questionnaire on the behalf of the superintendent pharmacist when he was not available. Pharmacists who worked in unregistered premises, wholesales outlet pharmacists, intern pharmacists, National Youth Service Corp (NYSC) pharmacists and pharmacy students who were on industrial training or externship programme were excluded from the study. The reasons for excluding these sets of pharmacists from the study were because unregistered premises are not recognised by PCN, wholesales outlet pharmacists' do not normally attend to patients; student and intern pharmacists are still undergoing training.

The questionnaire was distributed at the monthly meetings of the community pharmacists in each state. The Association of Community Pharmacists of Nigeria (ACPN) holds its meeting once every month in these states and approval to conduct this study was obtained

from the respective chairman of each state branch of the association. The questionnaires were distributed to the superintendent pharmacists of the registered premises on the PCN list. The distribution of the questionnaire was done at two different meetings of ACPN in each state to cover all the registered premises on the PCN list used, however, the superintendent pharmacists who did not attend the two meetings were visited at their premises. On the average it took each respondent twenty minutes to fill the questionnaire. Out of the 68 superintendent pharmacists in the registered premises in these states; 65 (95.59%) agreed to take part in the study and completed the filling of the questionnaire.

Pre-tested 34-item semi-structured self administered questionnaires were used to collect information from the participants who consented to take part in the study. The questionnaire was pretested by giving it to eleven community pharmacists in Ibadan, Oyo state, who were not part of the targeted study group and also to three pharmacists in academia for face and content validity. The outcome of the pre-test was not included in the results. Likert scales with five graded responses were suggested for the type and frequency of LTs ordered by the pharmacists and for factors which formed the basis of ordering and interpreting LTRs.

The five graded responses for the type and frequency of LTs ordered was: never, very rarely (once in a year), rarely (1 -2 times in six months), less frequently (once a month), frequently (> 5 times/month). The graded responses for the basis of ordering and interpreting LTRs was never, rarely, sometimes, very often and always (coded as 1, 2, 3, 4, and 5 respectively), The Cronbach's alpha for internal consistency of the scale for the basis of ordering and interpreting LTRs was 0.79. The total number of semi-structured questions on the questionnaire was also reduced from 44 to 34. Ambiguous and leading questions were removed.

Socio-demographic information on the respondents and location of the premises were obtained while other sections of the questionnaire were designed to obtain data on pharmacists' involvement in ordering LTs, frequency and type of tests ordered and what is done with the result among other things.

The perceived benefits derived from ordering LTs and the pharmacists' knowledge on the factors that may affect them were evaluated. Questions on what the pharmacists believed to be the requirements needed to interpret LTRs were also asked.

Data analysis: The data obtained from the study was subjected to appropriate statistical analysis using the Statistical Package for Social Sciences (SPSS) Window version 15.0. Descriptive statistics (frequency and percentages), Mann Whitney U and Kruskal Wallis tests were used to evaluate the data as appropriate and $p < 0.05$ was considered statistically significant.

RESULTS: Out of the sixty five (95.59%) respondents who consented to participate in the study from a total of sixty-eight; fifty (76.9%) were males and 15 (23.1%) were females. They had between 5 and greater than 25 years experience as CPs. Most of the pharmacies studied were located in residential area 21 (32.8%) and mixed area: residential and commercial 31 (48.5%) see **Table 1**. All the respondents 65 (100%) had asked their patients to go for LTs prior to the study. The commonly ordered LTs are listed in **Table 2 and 3**, and shows blood pressure measurement as having the highest rank of 58 (89.2%), among tests with a frequency of ordering greater than five times a month.

Forty eight (73.8%) respondents in the study sold POCT kits such as digital blood pressure monitors, glucometers and cholesterol monitors/test strips to their patients and also teach and assist on the use and interpretation of the result from the kit respectively. The reasons given for ordering LTs in order of importance are listed in **Table 4** and aside from ordering LTs for patients; 46 (70.7%) of the respondents agreed that they frequently receive patient and physician initiated LTRs from patients for interpretation.

Whenever LTRs were received, 63 (96.9%) of the pharmacists helped the patients to interpret the results, 53 (81.5%) advised the patients on the appropriate medication to use if the test indicated it, 60 (92.3%) referred patients to specialists if there was a need for it, 59 (90.8%) counsel the patients to allay fear and 4 (6.2%) followed up on previous investigation(s) done for the patient..

TABLE 1: SUMMARY OF RESPONDENTS' DEMOGRAPHIC CHARACTERISTICS

VARIABLE (N=65)	Frequency (%)	VARIABLES (N=65)	Frequency (%)
GENDER		**QUALIFICATIONS**	
Male	50 (76.9)	First degree (Pharmacy)	32 (49.2)
Female	15 (23.1)	Additional qualifications	33 (50.8)
AGE (years)		**LOCATION OF PHARMACY***	
21-30	10 (15.4)	Residential area	21 (32.8)
31-40	22 (33.8)	Commercial area	10 (15.6)
41-50	12 (18.5)	Industrial area	2 (3.1)
>50	21 (32.3)	Mixed area (residential + commercial)	31 (48.5)
MARITAL STATUS*		**RESIDENTS ECONOMIC STATUS***	
Single	10 (15.6)	Low income earners	15 (23.8)
Married	54 (84.4)	Medium income earners	37 (58.7)
STATE OF SURVEY		High income earners	3 (4.8)
Oyo	37 (56.9)	Both low & medium income earners	8 (12.7)
Osun	28 (43.1)	**YEAR OF EXISTENCE OF PHARMACY***	
YEARS OF EXPERIENCE		≤ 6.00	14 (22.6)
<5	14 (21.5)	7 – 10	20 (32.3)
5-15	23 (35.4)	11 – 13	5 (8.1)
16-25	10 (15.4)	14 – 20	12 (19.4)
>25	18 (27.7)	≥ 21	11 (17.6)

*N<65

TABLE 2: INVASIVE LABORATORY TESTS COMMONLY ORDERED AND INTERPRETED BY COMMUNITY PHARMACISTS

LABORATORY TESTS (N = 65)	FREQUENCY OF ORDERING (%)				
	NEVER	VERY RARELY (once in a year)	RARELY (1 -2 times in six months)	LESS FREQUENTLY (Once a month)	FREQUENTLY (> 5 times/month)
Pregnancy test (Blood sample)	24 (36.9)	9 (13.8)	7 (10.8)	10 (15.4)	15 (23.1)
Mantoux test	4 3(66.2)	7 (10.8)	7 (10.8)	5 (7.7)	3 (4.6)
Blood M/C/S	33 (50.8)	6 (9.2)	8 (12.3)	10 (15.4)	8 (12.3)
Widal Reaction test	5 (7.7)	0 (0)	3 (4.6)	12 (18.5)	45 (69.2)
VDRL	41 (63.1)	6 (9.2)	9 (13.8)	7 (10.8)	2 (3.1)
HIV I and II	24 (36.9)	10 (15.4)	7 (10.8)	15 (23.1)	9 (13.8)
Full blood count	24 (36.9)	8 (12.3)	5 (7.7)	12 (18.5)	16 (24.6)
Packed cell volume	22 (33.8)	6 (9.2)	5 (7.7)	14 (21.5)	18 (27.7)
Blood grouping (ABO and RH)	27 (41.5)	5 (7.7)	7 (10.8)	13 (20.0)	13 (20.0)
Blood genotype	21 (32.3)	5 (7.7)	7 (10.8)	15 (23.1)	17 (26.2)
Erythrocyte sedimentation rate	47 (72.3)	6 (9.2)	5 (7.7)	6 (9.2)	1 (1.5)
Fasting blood glucose	13 (20.0)	4 (6.2)	9 (13.8)	15 (23.1)	24 (36.9)
Random blood glucose	22 (33.8)	5 (7.7)	10 (15.4)	13 (20.0)	15(23.1)
2 hours Post prandial blood glucose	36 (55.4)	4 (6.2)	8 (12.3)	8 (12.3)	9 (13.8)
Malaria parasite	7 (10.8)	2 (3.1)	3 (4.6)	6 (9.2)	47 (72.3)
Hepatitis B and C test	39 (60.0)	5 (7.7)	12 (18.5)	6 (9.2)	3 (4.6)
Heaf test	54 (83.1)	5 (7.7)	5 (7.7)	1 (1.5)	0 (0)
Female infertility test	41 (63.1)	10 (15.4)	6 (9.2)	4 (6.2)	4 (6.2)
Male infertility test	38 (58.5)	12 (18.5)	6 (9.2)	5 (7.7)	4 (6.2)
Total cholesterol level	36 (55.4)	10 (15.4)	6 (9.2)	7 (10.8)	6 (9.2)

M/C/S - Microbial Culture and Sensitivity, VDRL – Veneral Disease Research Laboratory, HIV – Human Immunodeficiency Virus.

In interpreting LTRs the community pharmacists were equally divided in their opinion as to whether pharmacists should interpret LTs ordered by them, alone or in conjunction with the physicians. The reasons given by those who believed that pharmacists should interpret LTRs alone were: pharmacists can interpret simple tests 26 (80.7%), the interpretation is for preliminary diagnosis 2 (6.9%) and a participant

(3.4%) believed that since the pharmacists are member of the health care team and the custodian of drugs, they can as well interpret LTRs. Those who agreed that the interpretation of LTRs should be done in conjunction with the physicians believed it should be so: for proper interpretation of the LTRs 13 (40.6%), team work and to complement knowledge 13 (40.6%). They believed that when there is possibility of complication the interpretation of LTRs should be done in conjunction with physicians 2 (6.3%). Other reasons given were that physicians have legal right to prescribe Prescription Only Medicines 1 (3.1%) and pharmacists lack sufficient skill to interpret LTRs 1 (3.1%). A respondent opined that physicians have comprehensive record of the patients and are better trained in the diagnosis of diseases 1 (3.1%). Some of the respondents 16 (24.6%) took medication history of the patient before the LTs were ordered, others 33 (50.8%) took it before interpreting the outcome of the LTRs while some respondents 7 (10.8%) rarely take medication history of the patients.

When asked how the medication history of the patients were kept, twenty two (33.8%) of the respondents kept them in patients file in the computer, 16 (24.6%) had no means of keeping them, 10 (15.4%) kept medication history in their memory because they knew most of their patients and 17 (26.2%) made a note of it and asked the patient to keep it and bring it always. In cases where patients were referred to specialists, the referral notes were accompanied with patient's medication history 25 (38.5%), patient's family history 5 (7.7%), patient's complain 41 (63.1%) and drug recommendations 13 (20.0%). Eight (12.3%) of the respondents did not accompany the referral note with anything.

The pharmacists agreed that for any community pharmacists to be able to order and interpret LTRs, he must possess the qualities or qualifications listed in **Table 5** and the perceived benefits derived from interpreting LTRs for the patients were: patient trust and confidence in pharmacists 28 (43.1%), improved medication compliance 2 (3.1%), job satisfaction and relevance to the community 8 (12.3%), revenue generation 5 (7.7%), assisting patient in the treatment and management of diseases 5 (7.7%), good therapeutic outcome 5 (7.7%), assisting with preliminary diagnosis 5 (7.7%), goodwill 2 (3.1%) and improved knowledge 2 (3.1%).

TABLE 3: NON-INVASIVE LABORATORY TESTS COMMONLY ORDERED AND INTERPRETED BY COMMUNITY PHARMACISTS

LABORATORY TESTS (N= 65)	FREQUENCY OF ORDERING (%)				
	NEVER	VERY RARELY (once in a year)	RARELY (1 -2 times in six months)	LESS FREQUENTLY (Once a month)	FREQUENTLY (> 5 times/month)
Pregnancy test (Urine sample)	3 (4.6)	1 (1.5)	4 (6.2)	11 (16.9)	46 (70.8)
Urine M/C/S	20 (30.8)	5 (7.7)	9 (13.8)	19 (29.2)	12 (18.5)
Urinalysis	21 (32.3)	8 (12.3)	11 (16.9)	15 (23.1)	10 (15.4)
Stool M/C/S	32 (49.2)	9 (13.8)	10 (15.4)	13 (20.0)	1 (1.5)
Occult blood (faeces)	43 (66.2)	5 (7.7)	9 (13.8)	6 (9.2)	2 (3.1)
Helicobacter pylori test (faeces/sputum)	43 (66.2)	8 (12.3)	5 (7.7)	6 (9.2)	3 (4.6)
Sputum M/C/S	27 (41.5)	9 (13.8)	11 (16.9)	14 (21.5)	4 (6.2)
Sputum for AFB	36 (55.4)	7 (10.8)	8 (12.3)	13 (20.0)	1 (1.5)
Urethral swab M/C/S	37 (56.9)	6 (9.2)	9 (13.8)	10 (15.4)	3 (4.6)
Wound swab M/C/S	39 (60.0)	6 (9.2)	7 (10.8)	11 (16.9)	2 (3.1)
Skin snip for microfilaria	32 (49.2)	13 (20.0)	10 (15.4)	6 (9.2)	4 (6.2)
Skin scraping for fungal elements	41 (63.1)	6 (9.2)	10 (15.4)	8 (12.3)	0 (0)
Seminal fluid analysis	36 (55.4)	6 (9.2)	9 (13.8)	11 (16.9)	3 (4.6)
Barium meal test	46 (70.8)	6 (9.2)	5 (7.7)	7 (10.8)	1 (1.5)
Higher vaginal swab M/C/S	34 (52.3)	5 (7.7)	7 (10.8)	11 (16.9)	8 (12.3)
Eye and Ear swab M/C/S	38 (58.5)	9 (13.8)	8 (12.3)	9 (13.8)	1 (1.5)
Ovulation profile	35 (53.8)	12 (18.5)	4 (6.2)	8 (12.3)	6 (9.2)
Blood pressure measurement	0 (0)	4 (6.2)	1 (1.5)	2 (3.1)	58 (89.2)

M/C/S - Microbial Culture and Sensitivity, AFB – Acid Fast Bacilli

TABLE 4: THE INFLUENCE OF AGE, YEARS OF EXPERIENCE AND QUALIFICATION ON REASONS WHY COMMUNITY PHARMACISTS ORDER LABORATORY TESTS

Reasons for ordering laboratory tests (N=65)	Frequency (%)					50th percentile	P-values		
	Never	Rarely	Sometimes	Very often	Always		U	K1	K2
To determine drug dosage	27(41.5)	9(13.8)	7(10.8)	13(20.0)	9(13.8)	2.0	0.170	0.911	0.686
To check for adverse drug reaction or toxicity	32(49.2)	5(7.7)	10(15.7)	11(16.9)	7(10.8)	2.0	0.757	0.862	0.366
To evaluate medication efficacy	20(30.8)	5(7.7)	7(10.8)	10(15.4)	23(35.4)	4.0	0.136	0.366	0.458
To monitor adherence to therapy	27(41.5)	4(6.2)	6(9.2)	11(16.9)	17(26.2)	3.0	0.034*	0.758	0.522
To aid in the detection of certain diseases	7(10.8)	0(0)	1(1.5)	10(15.4)	47(72.3)	5.0	0.789	0.037*	0.011*
To generate revenue	51(78.5)	6(9.2)	4(6.2)	4(6.2)	0(0)	1.0	0.218	0.871	0.632
To help patient understand how non-adherence affects treatment outcomes	27(41.5)	3(4.6)	5(7.7)	11(16.9)	19(29.2)	3.0	0.561	0.551	0.868
To diagnose diseases	7(10.8)	0(0)	21(3.1)	11(16.9)	45(69.2)	5.0	0.651	0.162	0.615
To perform therapeutic drug monitoring	24(36.9)	6(9.2)	4(6.2)	15(23.1)	16(24.6)	3.0	0.151	0.891	0.463
For screening purposes to identify patients at risk of developing certain diseases	24(36.9)	3(4.6)	4(6.2)	10(15.4)	24(36.9)	4.0	0.776	0.011*	0.073

U – p values for association between qualifications and reasons for ordering laboratory tests (Mann Whitney U test), K1 and K2 – p values for the association of years of experience and age with reasons for ordering laboratory tests (Kruskal Wallis test) respectively, *P < 0.05

TABLE 5: QUALITIES REQUIRED BY COMMUNITY PHARMACISTS TO INTERPRET LABORATORY TEST RESULTS

Qualities (N = 65)	Frequency (%)
Must possess adequate knowledge of interpreting laboratory values	32 (49.2)
Must have basic knowledge of pathology	13 (20.0)
Must possess clinical pharmacy degree	8 (12.3)
Must have long standing practicing experience	3 (4.6)
Must be up to date in clinical pharmacy practice and orientation	5 (7.7)
Must be up to date in drug information	2 (3.0)
Must be up to date in laboratory tests development	2 (3.0)

Demographic variables such as age, qualifications and years of experience had significant influence on some of the reasons why community pharmacists order and interpret laboratory tests ($p<0.05$, see Table 4). Pharmacists with additional qualifications other than the basic pharmacy degree (mean rank: 37.67) considered the monitoring of adherence to therapy as a strong factor in ordering laboratory tests more than pharmacists with only the first degree (mean rank: 28.18) ($p<0.05$ Table 4). The years of experience of CPs had a significant influence on two of the reasons why laboratory tests were ordered and interpreted. These reasons were detection of certain diseases and screening to identify patients at risk of developing certain diseases. Pharmacists with less than 5 years experience in the practice (mean rank: 39.96) were influenced mostly by the former reason than others with more years of experience [mean ranks: 5-15 years (33.91), 16-25 years (35.35) and >25 years (25.11)] but pharmacists with 5-15 years practice experience and those in the age bracket of 31-40 years were more predisposed to the later reason of ordering laboratory tests for patients $p<0.05$ (Table 4). However, independent categorical variable like sex, marital status, location of the pharmacy, economic status of residents around the community pharmacy and the years of existence of the pharmacy had no significant influence on any of the reasons why community pharmacists order laboratory tests $p>0.05$.

DISCUSSION: In this study about three quarter of the participants were engaged in performing some form of onsite Point of Care Testing (POCT) for their patients. Pharmacists have greatly contributed to the welfare and wellbeing of patients with chronic illnesses by rendering this form of pharmaceutical care.

Community pharmacists have used point of care (POC) cholesterol monitor and International Normalised Ratio monitor to improve the identification and management of hyperlipidemia and to effectively managed anticoagulation therapy respectively [6, 10, 11] Because of the ideal positioning of community pharmacists, they provide patient education on selection and use of these monitors and the interpretation of the results [6].

Besides the POC monitors that the study group pharmacists used, they also order various forms of tests not available as POC which may sometimes require sophisticated equipments (Table 2). Some of these tests can be used in screening the population for various diseases such as Tuberculosis, Filariasis, Hepatitis, Hyperlipidemia, Dyslipidemia, Diabetes Hypertension e.t.c. Community pharmacists have been shown to be involved in screening for cardiovascular and cerebrovascular risk factors [19, 20].

One of the reasons the CPs gave for ordering these tests was to aid in the detection of diseases which is in conformity with screening exercises. Another reason was for preliminary or presumptive diagnosis of diseases which might help in assisting the physicians' when patients are referred to them. This may also reduce the length of time the patient stays with the physician if there is collaboration between the pharmacists and the physicians. This form of collaboration between pharmacists and other members of the health care team can result in placing emphasis on provision and coordination of continuity of care in the management of chronic diseases [21].

Another reason given for ordering LTs was to generate revenue; in what form the revenue was generated, was not clearly stated. The revenue may be in form of charges for the service(s) rendered or an anticipation of increased patronage from the patient. The fact that patients sometimes bring LTRs ordered by physicians or patients themselves to pharmacists for interpretation may point to the trust patients who practice such placed on their pharmacists, though the patients reason(s) for doing such was not the focus of the study, but it suffice to know that some patients trust the pharmacist to interpret their test result(s) as adequately as their physicians would or probably to get a second opinion.

Community pharmacists who chose to interpret ordered LTRs alone, sometimes recommend medications to the patient if the test indicated such. It should be noted that there is no existing law in Nigeria which allows pharmacists to prescribe Prescription Only Medicines (POM) but in some countries like United States of America, United Kingdom, New Zealand and Canada, pharmacists are allowed to prescribe some selected drugs [22-24].

In the United State the American Medical Association (AMA) sought through resolution 307 to restrict the ordering and interpretation of LT to physicians and dentists and that diagnostic laboratory tests should only be ordered by those who have clinical education and training and must be under the aegis of a licensed physician [25]. AMA opined that the pharmacists and other non-physicians lack proper background to interpret laboratory results. However, those who are in support of pharmacists interpreting LTRs claimed that they have adequate knowledge to do so. In the words of Alex Otto: "*Pharmacists are not diagnosing with these tests.... instead, they perform a triage and referral function and monitor medication use. ..... Pharmacists are directing patients to physicians, not taking them away, and freeing physicians from screening hundreds of people so they can focus on patients who really do need help*" [25]

In West Africa, community pharmacies are usually the first point of call when patients have medical complaints [4, 26] since they do not charge for consultation and are often times closer to the patients. This might inform why community pharmacists order laboratory test for patients and then interpret it alone or sometimes in collaboration with the physicians. Here in Nigeria there is no specific law delineating who should order laboratory tests, however, it is the general belief of members of the health care team that this is a function of the physician.

Two-fifth of the participants accompanied referral notes with the patients medication history, less than one-tenth accompanied the referral note with the patients family history, three-fifth with patient complaint and one-quarter with the recommended drugs. The importance of patients' medication history cannot be overemphasised in the interpretation of LTRs since some drugs have been known to give false

positive result and others increase or decrease the value of some tests [27]. Detail medication history may detect or rule out the possibility of such interference. An existing family history of certain disease may predispose the patient to an ailment and a detail family history will help clarify this. Also absence of such in the family history may also help whoever that is interpreting to exercise caution in the interpretation of supposedly abnormal value and allow him to explore other reasons that might be responsible apart from genetic influence. The community pharmacists in this study considered all these factors while interpreting LTRs and this may go a long way in complementing the physicians' decision if there is collaboration between pharmacists and physicians in the immediate vicinity of the community pharmacy

One of the major benefits derived by the study group CPs in the ordering and interpretation of LTs was that it built patients' trust and confidence in the pharmacists and gives job satisfaction. This was attested to in the study when pharmacists stated that they also receive from patients, LTRs from patient-initiated orders and physician-initiated orders. However, revenue generation or compensation was of little benefit to the study participants in rendering this form of PC.

The qualities that a community pharmacist must possess in order to be able to order and interpret LTRs as suggested by the participants were; adequate knowledge of interpreting LTRs, basic knowledge of pathology and possession of clinical pharmacy degree. The first two points are covered in the current curriculum of undergraduate pharmacy students in Nigeria while clinical pharmacy degree is offered at the postgraduate level. Thus, fresh graduates of pharmacy schools should be able to order and interpret simple LTs and be able to render this aspect of pharmaceutical care continuum.

Recent studies [28, 29] showed that pharmacy students from two pharmacy schools in Nigeria had a positive attitude towards the practice of pharmaceutical care. A study carried out by Erah and Nwazuoke [30] in Benin City discovered that few pharmacists who currently apply some of the PC practice standards as outlined by the Delphi Expert Panel had clinical pharmacy training and worked in hospitals and community pharmacies, buttressing the point suggested by participants in this study that the possession of a clinical pharmacy degree may be considered as one of the prerequisite for a community pharmacist to order and interpret LTs.

CONCLUSION: Majority of the community pharmacists in the two South-western states of Nigeria order laboratory tests that were different from Point of Care Testing and also interpreted the outcome of the tests either in conjunction with physicians or by themselves. Since community pharmacists are interpreting some laboratory tests, these may help in relieving the burden on the physicians and cut down on the time patients spend during doctor's visit, if done in collaboration. The ordering and interpretation of laboratory tests by community pharmacists may also help in screening patients for diseases and thus assist in the early detection of diseases.

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