Assessment of the awareness, perception and practice of personalized medicine service among pharmacists in Osun State, Southwestern Nigeria

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ABSTRACT

Background: The era of personalized medicine service (PMS) is emerging globally and it has contributed immensely to effective use of medicine and medical treatment. However, this may not hold for the healthcare system in several climes where the concept has not been embraced by practitioners. Thus, there is a need to assess the perception and extent of practice of PMS.

Objective: This study was carried out to evaluate the perception of pharmacists in Osun State about PMS, and to determine the extent to which it is utilized in their practice.

Methods: A cross-sectional survey of 207 pharmacists was carried out in Osun state using a pre-tested questionnaire to gather information on respondents' knowledge and extent of practice of PMS. Statistical analyses were performed to describe the variables and to evaluate the extent of associations and the significance of such associations among the study variables.

Results: Out of the 207 questionnaire administered, one-hundred and fifty-eight pharmacists responded to this survey within the stipulated period. Out of this number, 104 (representing 65.8%) were males. Some (45.6%) practiced in hospital. Fifty-two percent had not offered PMS before, and a perception rating of 2.86 ± 0.72 on a 4-point Likert scale was recorded among the respondents. The study reported a strong significant association in the perception of PMS and the area of practice ($p = 0.018$) as well as job status ($p=0.009$). Similarly, among those who had previously offered PMS, areas of practice and qualification of the respondents were significantly associated with the extent of practice of PMS.

Conclusion: A fair perception of PMS was reported among the pharmacists in Osun state but the extent of practice was abysmally low.

Keywords: Personalized medicine service, awareness, perception, healthcare system.

Évaluation de la sensibilisation, de la perception et de la pratique des services de médecine personnalisée chez les pharmaciens de l'État d'Osun, dans le sud-ouest du Nigéria

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RÉSUMÉ

Contexte: L'émergence des services de médecine personnalisés (SMP) à l'échelle mondiale et a contribué de manière considérable à l'utilisation efficace des médicaments et des traitements médicaux. Cependant, cela pourrait ne pas être le cas pour le système de santé dans plusieurs pays où le concept n'a pas été adopté par les praticiens. Il est donc nécessaire d'évaluer la perception et l'étendue de la pratique des SMP.

Objectif: Cette étude a été menée pour évaluer la perception des pharmaciens de l'État d'Osun à propos du SMP et pour déterminer dans quelle mesure il est utilisé dans leur pratique.

Méthodes: Une enquête transversale a été menée auprès de 207 pharmaciens dans l'État d'Osun à l'aide d'un questionnaire pré-testé pour recueillir des informations sur la connaissance, la perception et l'étendue de la pratique des SMP par les répondants. Des analyses statistiques ont été effectuées pour décrire les variables et évaluer l'étendue des associations et la signification de ces associations parmi les variables de l'étude.

Résultats: Sur les 207 questionnaires administrés, cent cinquante-huit pharmaciens ont répondu à cette enquête dans le délai imparti. De ce nombre, 104 (soit 65,8 %) étaient des hommes. Certains (45,6 %) exerçaient en milieu hospitalier. Cinquante-deux pour cent d'entre eux n'avaient jamais proposé de SMP auparavant et une note de perception de 2,86 ± 0,72 sur une échelle de Likert à 4 points a été enregistrée parmi les répondants. L'étude a révélé une forte association significative entre la perception du SMP et le domaine de pratique ($p = 0,018$) ainsi que le statut professionnel ($p = 0,009$). De même, parmi ceux qui avaient déjà proposé du SMP, les domaines de pratique et la qualification des répondants étaient significativement associés à l'étendue de la pratique du SMP.

Conclusion: Les pharmaciens de l'État d'Osun ont une perception équitable du SMP, mais le dégrée de la pratique est extrêmement faible.

Mots clés : perception, service de médecine personnalisée, sensibilisation, traitement médical.

INTRODUCTION

In recent time, the role of pharmacists as healthcare givers has been revolutionized and one of the add-on roles is personalized medicine service (PMS). This is considered to be an evolution from the 'one-size-fits-all' pharmaceutical model. Personalized medicine is conceptualized as a model that embraces predictive, preventive and participatory healthcare service.[1] PMS involves the use of genetic information and other patient-specific factors to predict the right drug and right dose or dosage regimen thereby ensuring that patients receive the exact drug/dose required for therapeutic benefits.[2,3] Tailoring the selection of both the drug and the dose for a specific patient is expected to optimize the benefit and minimize the harm of medical interventions. Thus, the goal of personalized medicine service is to identify patient characteristics predictive of response to therapy and to use this information to provide a therapeutically optimal dose for each patient, or patient subgroups, based on their individual characteristics.[4]

The core knowledge required by healthcare practitioners to render PMS effectively includes pharmacogenomics, Pharmacometrics and Therapeutic Drug Monitoring (TDM). In the United States of America, the Food and Drug Agency has incorporated this componential knowledge into the regulatory process *priori* to drug registrations, and efforts have been made to add relevant pharmacogenomic information to drug labeling. Also, the International Federation of Pharmacists (FIP) in 2015 during her annual conference discussed making medication unique through personalized medicine.[5] Similar toolkits have been adopted in other developed countries leading to partial implementation and practice of personalized dosing among healthcare professionals in those countries. However, this emerging role is still a mirage in developing nations such as sub-Saharan Africa as there are few researchers and publications on personalized medicine from the sub-region, and the major impasse is how this new orientation will be incorporated into the current pharmaceutical and medical practice.[6,7] This implementation of PMS may be a tall order without healthcare providers committing to its use in their practice.

Adequate dosing systems for individualised medicines are particularly critical for high potency drugs and vulnerable patient populations such as paediatric and geriatric patients. In order to ensure that the right drug is given to the right patient at the right time in a right manner and amount, certain parameters are required to be put into consideration by the health care professional, especially pharmacists, who are at the helm of affairs of dispensing pharmaceutical products to patients.[1] In order for Pharmacists to begin to practice PMS, there is a need for them to have adequate skills, knowledge and positive disposition towards implementation and practicing of individualization of dosage regimen. To achieve this, drug experts and other healthcare professionals must demonstrate readiness to incorporate PMS into their practice.[7]

Currently, there is scanty information on the practice and implementation of personalized medicine service in the Nigerian health care system; and the information to gauge the attitudes and justify the readiness of pharmacists in Nigeria is virtually non-existent.

This study was carried out to evaluate the perception and practice of PMS among Pharmacists in Osun State.

METHODS

Study design/participants

"The study was approved by the Health Research and Ethics Committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife (IPHOAU/12/680)". This cross-sectional study was open to all registered pharmacists in Osun state, Nigeria. Pharmacists in all areas of Pharmacy practice such as hospital, community, industrial and academic setting were eligible to take part in the study. The total number of pharmacists registered with Pharmacists Council of Nigeria (PCN) in Osun State between January and December 2015 was used to calculate the sample size for this study. Using the Raosoft Online calculator, the calculated sample size for the population of pharmacists (276 pharmacists) in Osun State was 177, making provision for 10 % attrition. However, two hundred and seven (207) questionnaires were administered to the pharmacists sampled by convenience based on their availability at their places of work and during the local monthly meeting of the various technical arms of the Pharmacy profession. Those who participated gave oral consent to voluntarily partake in the study. Those who failed to return their response within 3 months were excluded from the study.

Study instruments

A 25-question survey instrument was created and field-tested among pharmacists from various areas of Pharmacy practice during the annual general meeting of a cooperative society organized by pharmacists in Osun

state. During this pretest, questionnaires were administered to 20 pharmacists who were not included in the final study. The outcome was used to test the survey instrument for validity, clarity and reliability. This pretest helped in refining and enhancing usability of the final survey instrument. The final survey instrument was divided into three sections. The first section was about the socio-demographic features of respondents, such as age, gender, practice location, years in practice, qualification and job status. The second section contained questions seeking the knowledge of pharmacists on PMS while the third section contained questions on the practice of PMS.

Data collection

Data was collected through self-completed questionnaires by the pharmacists. The questionnaires were distributed to the hospital pharmacists by visiting the pharmacists at their posts in tertiary, secondary and primary health institution. Community pharmacists were sampled by visiting them in their pharmacy premises or during the monthly meeting of the Association of Community Pharmacists (ACPN). Few pharmacists who could not be contacted one on one received the survey instrument through e-mail upon their agreement to participate in the study following phone calls to them. Each pharmacist respondent was allowed to complete the survey only once. After distributing the questionnaires, follow-up reminders were carried out by visiting their offices, sending text messages or via phone calls. The research was conducted between May 2016 and July 2016.

Data analysis

All the data captured were analysed using Statistical Package for Social Science (SPSS) version 20. Both descriptive such as frequency, percentages, means and standard deviation (SD) were used to qualify the data while inferential method such as Chi- square was used to describe association or relationship among the covariate. Tables and bar chart was used to present the data.

RESULTS

A total of 158 out of 207 pharmacists responded to this survey, representing a response rate of 76.3 %. One hundred and four (65.8 %) of the respondents were males, 109 (68.3 %) were below 40 years of age, while 108 (67.9 %) fell within 1-10 years of experience in pharmacy practice. Concerning the areas of practice, 72 (45.6 %) of the respondent pharmacists practiced in hospital setting while 52 (32.9 %) of them were in the community pharmacy practice. Majority of the participants (112; 70.9 %) graduated with a B.Pharm degree, and majority (100; 63.7 %) was government employee. The details of the demographics of the respondents are presented in Table 1.

Table 1: Socio-Demographic features of the respondents.

Characteristics	Classification	Frequency (N)	Percentage (%)
Gender	Male	104	65.8
	Female	54	34.2
Area of Practice	Hospital	72	45.6
	Community	52	32.9
	Industry	2	1.3
	Academic	29	18.4
	Others (Regulatory)	3	1.9
Age (years)	22-30	52	32.9
	31-40	56	35.4
	41-50	32	20.3
	51-60	15	9.5
	61-70	3	1.9
Years of practice	1-10	108	67.9
	11-20	30	18.9
	21-30	12	7.5
	31-40	7	4.4
Highest qualification	B. Pharm.	112	70.9
	Pharm. D	11	7
	M. Sc.	17	10.8
	MBA	3	1.9
	MPH	1	0.6
	Fellowship	3	1.9
	Ph.D	11	7
Job Status	Government-employed	100	63.7
	Self-employed	26	16.6
	Private	31	19.7
Location of practice	Village/rural pharmacy	10	6.5
	Town	83	53.5
	Major town/City	62	40

Awareness of PMS among the Respondents

Table 2 indicates that 45 % of the respondents had previously received specific training on personalized dosing or medicine. Those who had received training on personalized dosing did so through conference and workshop participation (30 %). Twenty-nine percent (29 %) and 11 % of the respondents came across the subjects during undergraduate and postgraduate studies respectively, while 19 % of the participants had received training in more than one of the above-mentioned options. Among the respondents who had previously undergone training in personalized dosing were either self-sponsored by the pharmacists (66%) or sponsored by their institutions or industries 31%.

Chi square analysis at a p-value < 0.05 showed that there was no association between training received on personalized dosing and selected variable such as area of practice (?2= 2.595, p value = 0.628), job status (?2 = 1.002, p value = 0.606), years of practice (?2 = 2.553, p value = 0.466) and academic qualification(?2 = 8.734, p value = 0.189).

Table 2: Means of awareness of PMS among the Respondents.

Items	Response	Frequency (N)	Percentage (%)
Participation in Training on Personalized dosing	None	87	55
	Previously participated in training	70	45
	Total	157	
Type of Training	Conference/workshop participation	21	30
	Undergraduate courses on Personalized dosing	20	29
	Postgraduate courses on Personalized dosing	8	11
	Short course certificate	3	4
	On-line training	3	4
	Diploma program	1	1
	Others	14	20
	Total	70	
Who sponsored the training	Self-sponsored	46	66
	Government/Institution	22	31
	Others	2	3
	Total	70	
Workshop/seminar Organised by NAFDAC/PSN/PCN	Yes	15	9.9
	No	16	10.5
	Not aware	121	79.6
	Total	152	

Perception of PMS among the respondents

Perception scores were drawn from series of questions. The questions tested the perception of respondents on personalized dosing, its components, its perceived benefits or applications and core courses for educational exposure to personalized dosing. The respondents were also tested on the need for collaboration among the health care practitioners and their perceptions on the extent of implementation in pharmacy practice. The responses to the 13 items tested herein were rated based on 4-points Likert's scale. Ten of the 13 items were scored from strongly agree to strongly disagree by awarding maximum of 4 points to the strongly agree response while the remaining 3 items were rated in reversed order.

Perception scores among the respondents varied according to the items with weighted average of 1.72 ±1.32 for the lowest score to 3.62 ± 0.49 for the highest score (table 3). Most pharmacists have a good perception on the discourse of personalized dosing (77%), the skills required (69.5 %) and benefits (75.7 %). On the other hand, most respondents gave a poor perception on the need for collaboration among healthcare professionals for effective implementation of personalized dosing (43.5%). Also, most pharmacists (50.7 %) believe that implementation of personalized dosing is not considered at drug development stage.

Table 3: Perception of PMS by the respondents

Classification of Questions	s/n	Perceptions of PMS by Respondents	Mean ± SD
Definition of PMS	1	Personalized medicine preaches individualization of dosage regimen.	3.55 ±0.64
	2	Personalized medicine is not one-size-fits-all dosing approach	3.32 ±1.01
	3	Personalized dosing is a subset of Pharmaceutical Care	3.32 ±0.90
	4	PM is the same practice as Unit Dose Dispensing System	2.13 ±1.32
	5	Genetics may influence a drug disposition. & a patient's response to medication	3.52 ±0.81
Skills for PMS	6	Pharmacometrics, Pharmacogenomics & Therapeutic Drug Monitoring are components	2.78 ±1.30
Benefits of PMS	7	Personalized Dosing allow Tailoring of Dosage Regimen to meet specific need	3.62 ±0.49
	8	Personalized Medicine or Personalized Dosing promotes safety and efficacy of therapeutic agents	3.54 ±0.71
	9	Personalized Dosing is considered for special populations such as pregnant women, pediatric and geriatric patients.	3.21 ±0.93
	10	Personalized Medicine Service or dosing may be applied to all drugs	1.74 ±1.28
Practice of PMS	11	PMS is solely Pharmacists' initiative.	1.72 ±1.32
	12	PMS has become important component Pharmacy practice	1.79 ±0.96
	13	Consideration for PMS starts at drug development level	2.82 ±1.22
		Overall Average	2.86 ±0.72

Practice of PMS among the Respondents

Most respondents had not previously rendered personalized medicine service (52 %) while among the pharmacists who had previously offered personalized medicine service, 69.3 % offered service or advice on personalized dosage of medicinal products. Just a few respondents had previously offered core PMS such as drug-metabolising enzymes genetic testing (4 %) and individualized treatment of cancer (6 %).

Table 4 reflects the extent of involvement of respondents on a 5-point scale. The respondents showed much involvement with regards to PMS as it affects drug-drug interaction (3.78 ± 1.15) and drug information (4.26 ± 1.21). However, the participants scored very poor in patients genetics screening (1.86±1.13) and dispensing of genetic testing' kits (1.68 ± 1.01).

Table 4: Extent of practice of PMS among the Respondents

Components of PMS	Scores by respondents on 5-point scale x ± SD	Rating
Drug information/Patients' counselling	4.26±1.21	Good
Possible drug-drug interactions	3.78±1.15	Good
Geriatrics or pediatrics pharmacotherapy	3.45±1.38	Fair
Therapeutic Drug Monitoring (TDM) service	2.81±1.31	Fair
Management of renal or liver diseases	2.61±1.35	Fair
Unit dosing dispensing service (UDDS)	2.48±1.38	Poor
Chemotherapy/cancer management	2.24±1.29	Poor
Patients genetics screening	1.86±1.13	Poor
Dispensing of genetics testing' kits	1.68±1.01	Poor

Footnote: %*, 0 -49% = poor, 50 -69% = fair and 70% and above = good.

Associations of the socio-demographic features versus perceptions and the practice of PMS

Chi-square analysis of the socio-demographic variables at a P value of less than 0.05 (P< 0.05) revealed that there was a significant association between the perception and both area of practice (p = 0.018) and job status (p=0.009) as shown in Table 5. Influence of academic qualification on the perception of PMS among respondents is presented in Fig 2. There is a clear indication that Pharm. D holders have a better perception than B. Pharm. holders. Similarly, areas of practice and qualification of the respondents are significantly associated with some of the components of PMS as highlighted in Table 6

Table 5: Chi square analysis of the associations of the respondents' socio-demographic feature and perception of PMS

Socio-demographic features	Chi-square	P-value
Gender	0.489	0.783
Age	6.368	0.606
Location	5.737	0.22
Years of practice	8.765	0.187
Area of Practice	18.417	**0.018***
Qualification	17.145	0.144
Job status	13.649	**0.009***

* P-value less than 0.05 (Significant finding)

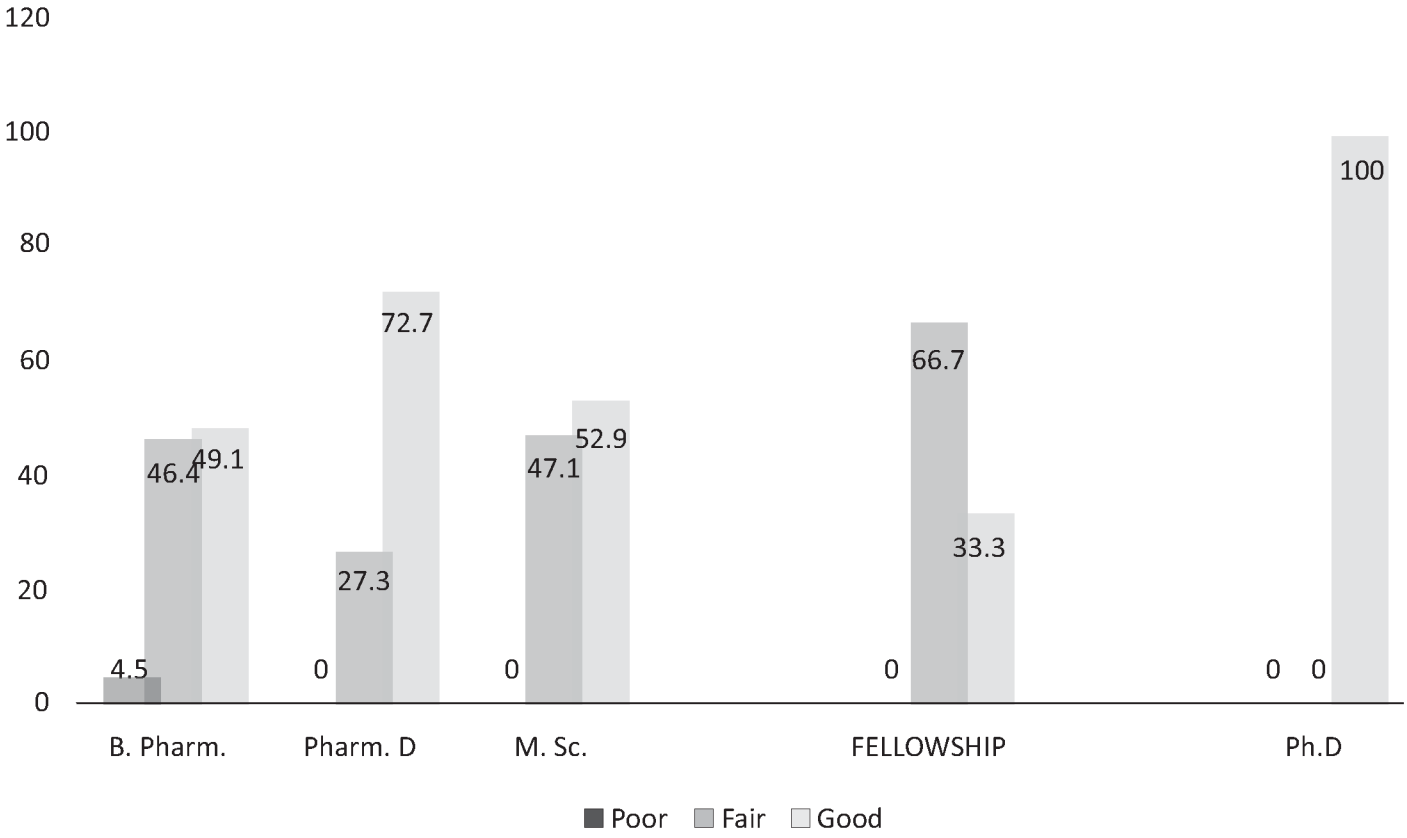

Fig 1:Influence of Academic qualification on the perception of PMS among pharmacists in Osun state.

Table 6: Chi square analysis of the associations of the selected socio-demographic feature and components of PMS

	Selected Socio-demographic profiles		
Components of PMS	**Areas of Practice**	**Qualification**	**Job Status**
Therapeutic Drug Monitoring			
Chi-square	31.586	43.287	13.004
P-value	**0.011***	**0.009***	0.112
Patients' genetic testing			
Chi-square	27.947	26.133	13.233
P-value	**0.032***	0.346	0.104
Dispensing of Genetic's testing Kits			
Chi-square	18.293	30.555	15.585
P-value	0.307	0.167	**0.049***
Unit Dose Dispensing System (UDDS)			
Chi-square	30.349	33.386	9.118
P-value	**0.016***	0.096	0.332
Chemotherapy/Cancer Management			
Chi-square	28.769	21.471	3.584
P-value	**0.026***	0.611	0.893
Geriatrics/Peadiatrics Pharmacotherapy			
Chi-square	44.893	48.447	7.959
P-value	**0.000***	**0.002***	0.437
Management of Renal/Liver diseases			
Chi-square	51.681	61.227	16.946
P-value	**0.000***	**0.000***	**0.031***
Drug-drug Interaction			
Chi-square	31.16	36.191	10.202
P-value	**0.013***	**0.053***	0.251
Drug information/Patients' counselling			
Chi-square	34.892	45.498	8.607
P-value	**0.004***	**0.005***	0.377

* P-value less than 0.05 (Significant finding)

DISCUSSION

This study focused on awareness, perception, practice of Pharmacists in Osun State, southwest Nigeria, with respect to PMS. The impact of globalization, socio-economic and medical needs have placed a demand on the pharmacy profession to always embrace or acquire new knowledge and skills. Though PMS is relatively an emerging role in pharmaceutical service, but the providers of such service who participated in this study revealed that 45% of the participating pharmacists had received specific training on PMS. Awareness of a particular service may be received either through a formal or informal training, discourse at professional meeting and public enlightenment.[9] Training may be directed specifically to personalized dosing or by day-to-day acquisition of professional knowledge. Some of the respondents confirmed their participation in PMS-directed training on personalized dosing or pharmacogenomics. The avenue for such a training reported in this study include conference/workshop participation, short course certificate, on-line platform training, diploma course and courses on personalized dosing or pharmacogenomics at undergraduate or postgraduate training. It is important to note that the majority of pharmacist respondents receive regular updates on personalized dosing via internet, professional meetings and journals. These activities are in line with substantial enthusiasm in the practice of personalize medicine by many healthcare professional as reported by Faulkner *et al*. (2012).[10]

Despite the fact that a little less than half had offered personalized medicine services in one form or the other, the frequency is generally low among the respondents. This study got the opinions of the respondents on the essential components of PMS such as TDM, patient genetics screening, dispensing of genetics kits, unit dose dispensing system, chemotherapy, Geriatrics or Pediatrics pharmacotherapy drug-drug interaction, management of liver or renal diseases and drug information service. The pharmacists had good perception of PMS. Few studies have assessed the attitudes and perception of pharmacists towards PMS and such studies reported that pharmacists have good perception of discourse subject.[6,11-13] Report from this study showed that the awareness of PMS among the pharmacists in the public health service is more concrete than those in private setting. Perhaps, pharmacist respondents employed by the private establishments are not motivated to acquire newer knowledge or skills as this is in line with the reports that showed that pharmacists engaged by private organizations tend to have low job satisfaction compared with their counterparts who works with government.[14] Even on this scale, the respondents who are self-employed are better than the pharmacists employed by private organization. This study vividly reveals that self-employed and government-employed pharmacists possess a far better perception of personalized dosing than those employed by private organizations. Though, not too many pharmacists from the industry participated in this survey but the perception of their representation was extremely poor as many of them do not focus on the end users of their products.

All the participants with PhD had good perception of PMS. Although the field of specialization of the Ph.D holders was not accessed, higher degrees, especially PhD greatly influenced the perception of the holders. Similarly, Pharm. D. holders when compared with B. Pharm holders had a superior perception of personalized medicine and whereas, a larger percentage of the pharmacists that participated held a B. Pharm. degree. The percentage of achieving a good perception of PMS in Pharm. D pharmacists was 72.7% while that of B. Pharm. was 49.1%. According to Abramowitz (2009), transformation has occurred in pharmacy education and practice, thus the present curriculum for B. Pharm. is largely insufficient in providing training on pharmacogenomics, Pharmacometrics, TDM and other components of PMS.[15] Pharmacy education is now more focused on clinical care of the patients and the development of products that will meet the expectation of patients and societal needs at large. In Nigeria, furore over Pharm. D degree still exists whereas from the outcome seen in this survey Pharm. D is needful and necessary for integrating personalized medicine into pharmacy practice.

Collaboration is very useful in all ramifications of pharmacy practice. However, most respondents showed poor disposition to the need for collaboration among the healthcare professionals (HCPs) for a proper implementation of personalized dosing service. The poor perception on the need for a team work on personalized medicine among HCPs may have taken its root from the inter-professional conflicts or rivalry observed among healthcare workers.[16] This factor may be seen as the stumbling stone to the full implementation of personalized dosing in Nigerian.

In this study, implementation of personalized dosing in pharmaceutical service in Osun state was low. Apart from

service such as advice on drug-drug interaction and drug information service, the critical components are rarely carried out by the participating pharmacists. The use of genetic testing among the respondents is very low, as only 4 % of the pharmacists in this study reported previously conducting a drug-metabolising enzyme genetic testing. This response is similar to the figure reported by Bannur *et al*. 2014 in a similar study conducted in Malaysia.[17]

Response on the involvement of individualized dosing in the treatment of cancer was also abysmally low. Regardless of the fact that this approach was considered as the best practice among the oncologists, only 6% of the pharmacists in this study have been previously involved in conducting individualized dosage regimen for oncologic patients.[18] This study shows that TDM, Pediatric and Geriatric Pharmacotherapy are not given adequate considerations among the respondents. Apart from the lack or inadequate facilities that plague most developing countries like Nigeria as a result of poor health funding, poor collaboration among HCPs may be a burdensome barrier to the implementation of PMS.[19] Affordability is another major barrier reported in the literature.[20] Despite these challenges, 62 % of the respondents are determined to render or inculcate personalized dosing into their practice.

CONCLUSION

Pharmacists in Osun State had fair perception of PMS. Area of practice and higher degrees greatly influenced their perception of PMS. The extent of practice of the respondents in rendering personalized medicine was very poor.

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