ABSTRACT

Objective: To assess the perception of physicians about clinical pharmacist's (CPs) role and the barriers to contribution of clinical pharmacy activities. Methods: A descriptive institutional-based study was carried on 27 public and one university hospitals where clinical pharmacy service is provided. A sample of 440 doctors, including consultants, registrars, medical and house officers were interviewed using structured questionnaire. Results: Of the doctors interviewed, 288 (65.5%) were females while 152 (34.5%) were males. The majority of the registrars104 (68.4%) were females while 48 (31.6%) were males. Of the total participants 406 (92.3%) believed that the pharmacist would add value to the clinical team, However, no significant difference between the four job categories was seen (P>0.05). A total of 419 (95.2%) of the doctors agreed that the pharmacist drug counseling would add value to the clinical team. A total of 430 (97.7%) doctors agreed that the time constraint is the main barrier. The weighted mean calculated to compile the doctors' perception of barriers showed that a total of 265 (60.2%) agreed that pharmacists facing barriers. Of our doctors 73.5 % ( n=294) were exposed to CPs in five sites. Rounds were the main exposure site. The doctors' job (position) showed a significant difference regarding their exposure to clinical pharmacists at the time of drug formulation and monitoring as well as the round time (P<0.05).

Conclusion: Medical doctors agreed that CPs would add value to the clinical team and they were facing barriers. The main exposure site between doctors and CPs were the clinical rounds.
KEYWORDS: Physicians' perception, Clinical pharmacists' role, Barriers.

INTRODUCTION

Clinical Pharmacy is the use of the pharmacist’s skills and knowledge of drugs and therapeutics to improve patient care (pharmaceutical care). It is defined as “The responsible provision of drug therapy for the purposes of achieving definite outcomes that improve a patient’s quality of life".[1] The concept of pharmaceutical care was introduced by Hepler and Strand.[2] Pharmaceutical care includes pharmacist input in the design, implementation and monitoring of a therapeutic plan, in collaboration with the patient and other healthcare professionals. This concept changed the focus of clinical pharmacy activities from processes to therapeutic outcomes.[3] Clinical pharmacy practice was first developed in the United Kingdom by two pharmacists, Graham Cadler and John Baker.[4] The revolutionary feature of these developments was the presence of the pharmacist in the ward. So the hospital pharmacist, whose main job was traditional pharmaceutical activities such as dispensing and manufacturing, was interacting then with patients and other healthcare professionals and directly intervening in the patient care process.[5] This enabled some pharmacy practitioners to become an active part of the clinical team.[6]

Studies have been conducted in some developing countries to assess physicians’ acceptance of the clinical pharmacists’ role. A study was carried out to investigate the perception and expectations of 462 medical doctors about the role of pharmacists in Pakistan's healthcare system; Sixty eight percent of the doctors appeared comfortable with pharmacists playing patient-centered roles. The majority, 299 (84.5%) expected pharmacists to take personal responsibility for resolving any drug-related problem. Furthermore, 76 % of them considered pharmacists as knowledgeable drug therapy experts. Only 50 % of the doctors thought that pharmacists apply their drug knowledge in practice while 11 % indicated that pharmacists routinely counseled their patients.[7] In another study, the majority of physicians (92%) and (87%) of nurses, said that the clinical pharmacist is an important integral part of the healthcare team.[8] In a study in Kuwait, Physicians appeared generally comfortable with pharmacists carrying direct outpatient roles in patients care but a large number of them appeared uncomfortable with pharmacists prescribing, even for a minor ailment.[9] In Sudan a study done to investigate medical practitioners’ perceptions, expectations and experience with the role of hospital-based pharmacists showed that (50.0%); 95% CI: 42.9–57.2%) of respondents never or rarely had interaction with pharmacists with regard to patient’s
medication, and the study suggested that many elements of patient-centered pharmaceutical care could be introduced with the co-operation of physicians.\cite{10} A study in Jordan showed that physicians in hospitals were more likely to accept or recognize traditional pharmacy services than newer clinical services.\cite{11}

Clinical pharmacy in Sudan started in the year 2004 when the degree of master of clinical pharmacy (MCP) was established at the Faculty of Pharmacy, University of Khartoum in collaboration with Bath University, United Kingdom by the training of postgraduate pharmacy students in clinical pharmacy.\cite{12} Parallel to this in 2005 the General Directorate of Pharmacy at the Federal Ministry of Health sent the first batch of pharmacists to Malaysia for MCP. The aim is to graduate clinical pharmacists for the supervision and follow-up of the clinical activities in hospitals and community pharmacies. In Sudan, the Ministry of Health is responsible for all matters pertaining to national planning and coordination in the healthcare sector so the CPs who graduated were assigned by Khartoum state Ministry as clinical pharmacists in the State hospitals where the implementation of Clinical pharmacy started. The number of CPs in both public and private sectors is small but has been increasing over the past few years. At the time of the study only 57% of Khartoum public hospitals were covered by 73 CPs.\cite{13} Successful implementation of pharmaceutical care requires cooperation between doctors and pharmacists. A better understanding of the professional relationship between CPs and doctors will be pre-requisite to aid the effective introduction of pharmaceutical care. Hence the physicians perception about the role of CPs, the scope of CPs' interaction with medical practioners, and barriers to contribution of clinical pharmacy activities in Khartoum state public hospitals need to be studied and these were the objectives of this study.

**METHODS**

**Study design**

This was a cross sectional; facility-based study carried in university and public hospitals covered by CPs in Khartoum state, Sudan. The study was conducted during June-July2013. Letters for ethical approval from Khartoum state Ministry of Health. The research committee within the selected hospital as well as from the respondents were obtained.

**Study Area:** Khartoum State contains a total of 49 public hospitals and four University ones. The ones that enrolled a CPs were targeted by the study.
Study Population

Study populations were the medical doctors who joined the work for at least six months. They were of four Categories; consultants, registrars, medical and house officers.

Sampling Design

Sampling selection

The cluster two stage sampling design was used where the selection of the study hospitals was first accomplished followed by the selection of doctors. All hospitals covered by CPs were assigned for the study that shapes the inclusion criteria of the study site, the others were excluded from the study. That was resulted in reaching a total of 28 hospitals (27 public and one university hospital).

Sample size

To achieve the objectives of the study, a stratified (a) Hospitals (university and public) hospitals covered by CPs. The total number of university hospitals were four, only one of them is covered by CPs which is Soba university hospital (SUH). It is a tertiary hospital with many specialties. Of the 49 public hospitals 27 were covered by CPs. Some of these hospitals had many specialties while others had only one specialty. Hospitals not covered by CPs were excluded. Each hospital is considered a cluster. (b)Doctors sample size was calculated according to the following equation:

\[ n = \left( \frac{z^2(p*q)}{d^2} \right) * d.eff \]

- \( n \) = desired sample size
- \( z \) = standard normal deviate = 1.96
- \( p \) = prevalence of occurrence (doctors’ exposure to CPs) = 50%
- \( q \) = (1-p) = 50%
- \( d \) (desired margin of error) = 0.05
- \( d.eff \) = the design effect = 1.5 for stratified two stage design.

Accordingly:

\[ n = (1.96^2*0.5*0.5/0.05^2)*1.5 \]

\[ n = 400 \]

To avoid the replacement in case of missing data the sample size was increased by 10% to give a total of 440 cases.
The selection of the sample units (doctors) was maintained by the researcher hand delivering of the questionnaires during working hours. The available categories found at the time of the data collection were interviewed. A range from 15 -16 medical doctors were interviewed offering the same size of them per a hospital.

Means and methods of data collection
By the mean of self administration, a semi-structured pre-coded questionnaires was introduced to be filled by the study targets. This questionnaire was adapted from the one used and validated for evaluating clinical pharmacy services. Prior its final implementation the questionnaire was pretested in two private hospitals covered by CPs.

Study variables
The main variables of the questionnaire were the doctor gender & position (job), CPs adding value to the clinical team, barriers preventing pharmacists to interact with the clinical team, exposure and interaction with clinical pharmacist.

Data analysis
The data were computed and analyzed using Statistical Package for Social Sciences (SPSS, version 19) and descriptive analysis was conducted. The Chi-square test was used to test the significance of the association between the independent variables (gender, and doctors' job) and the dependent variables (CPs adding value to the clinical team, barriers preventing pharmacists to interact with the clinical team). Statistical significance was accepted at a P value of < 0.05. Besides, a 3-point Likert scale was used for calculating the weighted average for Agree =3 , disagree = 2 and neutral =1 . The results were constructed to show the frequencies, percentages, mean and the S.D.

RESULTS
A total of 440 medical were interviewed, 288 (65.5%) were females while 152 (34.5%) were males.
Figure (1): Percents of Males and Females Medical Doctors by Job (position) in Hospital

Figure (1) above shows that the number of the registrars met with the study were the highest, 104 (68.4%) of them were females while 48 (31.6%) were males. The medical officers met with the study were the least, 47 (71.2%) of them were females while 19 (28.8%) were males.

Table 1. Doctors Perception about Pharmacists Adding Value to the Clinical Team

<table>
<thead>
<tr>
<th></th>
<th>Would add value</th>
<th>%</th>
<th>Would not add value</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant</td>
<td>88</td>
<td>94.6</td>
<td>5</td>
<td>5.4</td>
<td>93</td>
<td>21.1</td>
</tr>
<tr>
<td>Registrar</td>
<td>141</td>
<td>92.8</td>
<td>11</td>
<td>7.2</td>
<td>152</td>
<td>34.6</td>
</tr>
<tr>
<td>Medical officer</td>
<td>61</td>
<td>92.4</td>
<td>5</td>
<td>7.6</td>
<td>66</td>
<td>15.0</td>
</tr>
<tr>
<td>House officer</td>
<td>116</td>
<td>89.9</td>
<td>13</td>
<td>10.1</td>
<td>129</td>
<td>29.3</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>92.3</td>
<td>34</td>
<td>7.7</td>
<td>440</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 1 shows that 406 (92.3%) of the total Medical doctors believed that the pharmacist would add value to the clinical team, consultants 88 (94.6%) were the highest followed by the registrars 141 (92.8%) and the medical officers 61 (92.4%) that could be explained by the fact that they were mostly in contact with the clinical pharmacists in compare to the house officers whose percent was found to be the least 116 (89.9) of the total agreed that the clinical pharmacists would add value to the clinical team. However, no significant difference between them was seen (P>0.05).

Value adds to the clinical team

Table (2) below shows that a total of 419 (95.2%) of the doctors agreed that the pharmacist drug counseling would add value to the clinical team; with a mean = 2.92 and S.D = 0.36, followed by pharmacists' attendance of the clinical rounds with the mean = 2.88 and S.D. = 0.44. However, the 3 levels likart scale showed a weighted mean of 351 (79.8%) agreed that
pharmacists lining with the medical team would be a value adding with a mean = 2.80 and the S.D was = 0.42.

Table. 2: Distribution of Mean, Standard Deviation and Weighted Mean Of Doctors perception on Pharmacists Adding Value to the Clinical Team

<table>
<thead>
<tr>
<th>Values add</th>
<th>Agree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Total</th>
<th>Mean</th>
<th>S.D.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug counseling</td>
<td>419(95.2%)</td>
<td>8(1.8%)</td>
<td>13(3.0%)</td>
<td>440</td>
<td>2.92</td>
<td>0.36</td>
<td>Agree</td>
</tr>
<tr>
<td>Attendance of the clinical rounds</td>
<td>408(92.7%)</td>
<td>12(2.7%)</td>
<td>20(4.5%)</td>
<td>440</td>
<td>2.88</td>
<td>0.44</td>
<td>Agree</td>
</tr>
<tr>
<td>Medicine information for staff</td>
<td>403(91.6%)</td>
<td>13(3.0%)</td>
<td>24(5.5%)</td>
<td>440</td>
<td>2.86</td>
<td>0.48</td>
<td>Agree</td>
</tr>
<tr>
<td>Teaching</td>
<td>335(76.1%)</td>
<td>30(6.8%)</td>
<td>75(17.0%)</td>
<td>440</td>
<td>2.59</td>
<td>0.76</td>
<td>Agree</td>
</tr>
<tr>
<td>Availability in the pharmacy</td>
<td>265(60.2%)</td>
<td>95(21.6%)</td>
<td>80(18.2%)</td>
<td>440</td>
<td>2.42</td>
<td>0.78</td>
<td>Agree</td>
</tr>
<tr>
<td>Prescription writing</td>
<td>209(47.5%)</td>
<td>136(30.9%)</td>
<td>95(21.6%)</td>
<td>440</td>
<td>2.26</td>
<td>0.79</td>
<td>Disagree</td>
</tr>
<tr>
<td><strong>Weighted mean</strong></td>
<td>351(79.8%)</td>
<td>86(19.5%)</td>
<td>3(0.7%)</td>
<td>440</td>
<td>2.80</td>
<td>0.42</td>
<td>Agree</td>
</tr>
</tbody>
</table>

Table. 3: Distribution of Mean, Standard Deviation and Weighted Mean of Doctors perception on Pharmacists Facing Barriers

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Agree</th>
<th>Dis-agree</th>
<th>Neutral</th>
<th>Total</th>
<th>Mean</th>
<th>S.D.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time constraint</td>
<td>430(97.7%)</td>
<td>1(0.2%)</td>
<td>9(2.0%)</td>
<td>440</td>
<td>2.96</td>
<td>0.29</td>
<td>Agree</td>
</tr>
<tr>
<td>Lack of self confidence</td>
<td>291(66.1%)</td>
<td>78(17.7%)</td>
<td>71(16.1%)</td>
<td>440</td>
<td>2.50</td>
<td>0.76</td>
<td>Agree</td>
</tr>
<tr>
<td>Lack of knowledge, skills and training</td>
<td>216(49.1%)</td>
<td>126(28.6%)</td>
<td>98(22.3%)</td>
<td>440</td>
<td>2.27</td>
<td>0.80</td>
<td>Disagree</td>
</tr>
<tr>
<td>Staff shortage</td>
<td>167(38.0%)</td>
<td>164(37.3%)</td>
<td>109(24.8%)</td>
<td>440</td>
<td>2.13</td>
<td>0.78</td>
<td>Disagree</td>
</tr>
<tr>
<td>Lack of facilities</td>
<td>140(31.8%)</td>
<td>171(38.9%)</td>
<td>129(29.3%)</td>
<td>440</td>
<td>2.03</td>
<td>0.78</td>
<td>Disagree</td>
</tr>
<tr>
<td><strong>Weighted mean</strong></td>
<td>265(60.2%)</td>
<td>147(33.4%)</td>
<td>28(6.4%)</td>
<td>440</td>
<td>2.38</td>
<td>0.40</td>
<td>Agree</td>
</tr>
</tbody>
</table>

Table. 3: Table. 3: Distribution of Mean, Standard Deviation and Weighted Mean of Doctors perception on Pharmacists Facing Barriers

<table>
<thead>
<tr>
<th>Level</th>
<th>Weighted mean range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral</td>
<td>1 - 1.66</td>
</tr>
<tr>
<td>Disagree</td>
<td>1.67 - 2.33</td>
</tr>
<tr>
<td>Agree</td>
<td>2.34 - 3.00</td>
</tr>
</tbody>
</table>
Sites and time of exposures to clinical pharmacists

Table 4 below shows that five sites were assumed as contact sites between the medical doctors and the clinical pharmacists, those are the Drug formulation and monitoring, Clinical rounds, Drug counseling and information time, Outpatient clinics, Prescription of medication and at the teaching sessions. The doctors' job (position) showed a significant difference regarding their exposure to clinical pharmacists at the time of Drug formulation and monitoring as well as the clinical rounds time (P<0.05).

Table 4: Distribution of Medical doctors Exposure to Clinical Pharmacists by Doctors' job (position)

<table>
<thead>
<tr>
<th></th>
<th>Consultant N=72(26.2%)</th>
<th>Registrar N=97(33%)</th>
<th>Medical officer N=48(16.3%)</th>
<th>House officer N=77(24.5%)</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug formulation and monitoring</td>
<td>14(19.4%)</td>
<td>24(24.7%)</td>
<td>6(12.5%)</td>
<td>4(5.2%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Clinical rounds</td>
<td>41(56.9%)</td>
<td>57(58.8%)</td>
<td>26(54.2%)</td>
<td>27(35.1)</td>
<td>0.01</td>
</tr>
<tr>
<td>At drug counseling and information</td>
<td>37(51.4%)</td>
<td>54(55.7%)</td>
<td>19(39.6%)</td>
<td>29(37.7%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Outpatient Clinics</td>
<td>18(25.0%)</td>
<td>17(17.5%)</td>
<td>9(18.8%)</td>
<td>16(20.8%)</td>
<td>0.68</td>
</tr>
<tr>
<td>Prescribing advice</td>
<td>11(15.3%)</td>
<td>16(16.5%)</td>
<td>9(18.8%)</td>
<td>11(14.3%)</td>
<td>0.92</td>
</tr>
<tr>
<td>Teaching sessions</td>
<td>20(27.8%)</td>
<td>26(26.8%)</td>
<td>14(29.2%)</td>
<td>19(24.7%)</td>
<td>0.95</td>
</tr>
</tbody>
</table>

DISCUSSION

In this study the response of the participants was high (100%). The majority of the participants were females (65.5%) which is higher than females in another study where they constituted(56%).[8] The majority of the participants in the study were registrars followed by housemen. This is because these two categories had their internship rotations at public hospitals and supposed to be available during day and night.

The medical doctors believed that the pharmacist would add value to the clinical team. This goes with a study carried out in UAE where the majority of physicians (92%) said that the CP is an important integral part of the clinical team.[8] The house officers' percent was the least because they were newly enrolled in work compared to the other three groups and so have little experience and little exposure to CPs. However, no significant difference between the 4 groups was seen (P>0.05).

Value adds to the clinical team

The main responsibilities of the CP is to help patients to understand their medicines and how to take them and this is attained through drug counseling and the majority of the interviewed
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doctors agreed to this. It means that our physicians’ awareness about the role of the CP was good. The majority of our doctors agreed that CPs' attendance of the clinical rounds would add value. This goes with another study where only 33.9% of doctors don't expect pharmacists to be available for consultation during rounds.[11] Our study differs from another study where only 48.7% of the physicians agreed that the CP to be available during rounds.[9] This is because in most of the Arab countries an old model perception of the physicians about pharmacists is still prevailing. Also direct patient care which involves interaction with, and observation of the patient, is still exclusively in the hands of physicians, and pharmacists’ input in managing drug therapy ultimately depends on physicians’ willingness to accept this role.[9,11]

The majority of the doctors agreed that CPs would add value to the clinical team by giving medicine information for staff. This can be provided by pharmacists within the pharmacy department or when they are undertaking their clinical pharmacy duties in outpatient clinics or during the medical ward rounds.

More than three quarters of the doctors agreed that CPs participation in teaching would add value to the clinical team. There was a growing need for postgraduate training courses for pharmacists in clinical pharmacy; so many clinical pharmacists contribute to this teaching. Also Clinical pharmacy services include the regular provision of training and education for other health care staff at most hospitals.[14]

Doctor's agreement about CPs availability in the pharmacy was due to the fact that pharmacy education and practice in Sudan was product-focused and the new role of CPs is not yet implemented.[12] CPs can be represented in pharmacies and therapeutic committees as stated in another study where 92.5% of health care professionals agreed to this, but their main role was to be beside the patients.[8]

In this study 30.9% of the doctors disagreed that the pharmacist prescription writing would add value to the clinical team; this goes with other studies where doctors were uncomfortable and disagree with giving prescription rights to CPs.[9,11,15]

Pharmacists Facing Barriers

In this study the majority of the doctors said that lack of time was the main barrier. This is similar to another study where 78% of the hospital pharmacists said that lack of time was the
main barrier.\textsuperscript{[16]} This is due to increased pharmacists' work load in drug formulation and dispensing which decreases CPs' time available for clinical pharmacy activities.\textsuperscript{[17]} Pharmacy technicians must be made available to alleviate the burden of dispensing and free more time for the CPs to provide clinical services.\textsuperscript{[12]} Lack of staff is another barrier mentioned by our doctors. This is in agreement with another study where 71.2\% of the participants said that lack of the staff was a barrier.\textsuperscript{[16]} Currently in Sudan there is 1 pharmacist for every 7468 individuals.\textsuperscript{[12]} The current United States ratio is 1 pharmacist for 1500 individuals. The WHO threshold is 2.5 health care professionals (including pharmacists) per 1000 population to achieve Millennium Development Goal.\textsuperscript{[18]} Doctors agreement that lack of self confidence, lack of knowledge, skills and training and lack of facilities were barriers is due to the fact that the implementation of pharmaceutical care in a variety of settings were found to be embedded by attitudes of pharmacists, lack of pharmacists’ advanced practice skills, resource-related constraints, system-related constraints, and educational obstacles.\textsuperscript{[19]}

**Exposure to CPs**

Less than three quarters of the doctors were exposed to CPs. Clinical rounds was the main site for exposure. This is because all doctors usually attend the clinical rounds. There is a significant association between doctors' job and exposure to CPs in rounds. The CPs attendance at medical ward rounds enable them to give advice about choice of medicine, dose, method of administration, side-effects, interactions, monitoring requirements and many other aspects of medicines use. Studies reported that CPs advice had shown high rates of acceptance from medical staff, demonstrating that the role of CPs is both valued and effective.\textsuperscript{[14]} This is why drug counseling and information were other CPs exposure activity.

The third site of exposure is the teaching sessions where CPs educates healthcare staff about medicines dose, method of administration, side-effects, interactions, monitoring requirements and many other aspects of medicines use, a service that is valued highly.\textsuperscript{[14]}

The traditional role of outpatient prescription dispensing is being replaced in many hospitals by clinical pharmacy input into the clinics themselves, but small percents of our doctors were exposed to CPs in outpatient's clinic. This is due to the limited number of CPs in our country beside that clinical pharmacy implementation is newly started. Although the main site of exposure to CPs was clinical rounds but little number of doctors were exposed to them during prescribing advice. This advice can be given by CPs during medical ward rounds or in
outpatient clinics. This may be due to the fact that CPs was not encouraged by the consultants to do this.

During drug formulation and monitoring the registrars and consultants were the two categories to be exposed because they were usually ask for drug formulation beside the fact that the registrar is usually available in hospital and can monitor drugs. There is significant association between doctor's job and exposure to CPs in drug formulation and monitoring.

**CONCLUSION**

About two thirds of the doctors were females. The number of the registrars was the highest. The majority of doctors believed that the CP would add value to the clinical team. They also agreed that the pharmacist drug counseling would add value to the clinical team. Less than two thirds of the doctors agreed that pharmacists facing barriers and the majority of them agreed that time constraint was the main barrier. The main site of doctors' exposure to CPs was the clinical rounds. There is association between the doctor's job and exposure to CPs in rounds and during drug formulation and monitoring.

**ACKNOWLEDGMENT**

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