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ATTITUDES AND OPINION OF HOSPITAL PHARMACISTS TOWARDS EXTEMPORANEOUS COMPOUNDING AND RELATED ISSUES IN KHARTOUM CITY: PART II

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ABSTRACT

Objectives: To examine the frequency, nature and extent of extemporaneous compounding undertaken by Sudanese hospital pharmacists and determine their attitude on aspects related to extemporaneous compounding. **Methods:** 200 questionnaires were administered to randomly selected hospital pharmacies in Khartoum city. Feedback to most question was measures on 1-5 Likert scales. Data was collected from December 2015 to March 2016. **Results:** Response rate was 60%; 75.2% were females and 24.8% were males. 28.2% of respondents compounded 1-5 prescriptions weekly that comprised 3-5% of total prescriptions; most prescriptions were dermatological preparations; major reasons for compounding were product (53%), pediatric strength 42% and official preparations 41%; Major prescribers were dermatologist; Pharmacist who often compound prescriptions; appreciable number of respondents rated standard of equipments and quality of ingredients as high, respectively; 25% and 15.8% of respondents indicated that lack of ingredients and lack of time limited their immediate extemporaneous dispensing; Factors that greatly inhibit compounding were lack of equipments, lack of practice in compounding and time constrains; 49.6% of respondents stated that demand for compounding greatly decreased over the pat few years; 52.2% of the respondents thought that, extemporaneous compounding will be decreased in the future;

54.0% of respondents felt that their skill in compounding were increased since graduation; most respondents had high confidence and professional satisfaction in extemporaneous compounding; 54% of respondents felt that their training was inadequate and emphasis should be placed in training 31,7%; 71.2% agreed for periodical assessment of pharmacists in compounding; overall respondents felt that a refreshing course in extemporaneous compounding is useful. **Conclusion:** Extemporaneous compounding constitutes small part of hospital pharmacy activities, and respondents were strongly agreed that it should be kept within the profession. Several areas of improvement were identified and continuous education was highly demanded.

KEYWORDS: Extemporaneous, Compounding, Hospital Affiliation, Hospital Pharmacists, Attitudes, Constraints, Dispensing, Confidence, Satisfaction, Reasons.

INTRODUCTION

Extemporaneous compounding is defined as the preparation, mixing, assembling, packaging and labeling of a medicinal product based on prescription order from licensed prescriber for an individual patient.[2] Standard of practice state that, when possible, pharmacists should prepare drug formulations strengths, dosage forms and packages that are not commercially available but that needed for optimum patient care.[3-4] Extemporaneous compounding is one of the riskiest preparations in a pharmacy, this mainly due to the largest number of reported errors that have been linked to the lack of information on the compatibility, stability and bioavailability of extemporaneous compounded medicines. This lack of information poses problems for pharmacists when suitable dosage forms, concentrations or preparations not commercially available and must be prepared for individual patients according to prescription orders. In addition, pharmacy compounded drug are far less studied and documented than their industrial equivalents with respect biopharmaceutical aspects and safety, but in particular with respect to efficacy. In spite of this fact, however, only small number of extemporaneously compounded products is supported by evidence that showed the equivalent results achieved with commercially manufactured drug. On the other hand, studies showed that significant risks that extemporaneous compounding carries may be attributed to the using of unlicensed products combined with inherited risks associated with pharmaceutical compounding process.[5-8] Traditionally, extemporaneous compounding is among the fundamental responsibilities of pharmacists. However, since World War II this trend in extemporaneous prescription compounding has greatly decreased, but still strongly associated

with the profession image. Even Though performance of extemporaneous compounding in several developed countries by individual pharmacies either ceased to exist or was considerably decreased, nevertheless this trend in some other countries remained substantially until now.[9] In today's pharmacy compounding is primarily found in the realm of pharmaceutical care.[10] It has been suggested that compounded products are warranted in certain patient specific circumstances in which there is no licensed product or alternative, which fully meets the clinical needs of prescriber and patient. For that reason, it becomes necessary to extemporaneously prepare a limited quantity of a product for an individual patient.[6] For example, a product is needed, but it is not commercially available (e.g. orphan drug situations) or a specific dosage form or strength is required, particularly for children or elderly patients or when a drug is experimentally desirable. Other, considerable reasons for extemporaneous compounding are to improve patient's compliance and existing contraindication or allergy for an ingredient of specialty. In addition, cheaper cost and perceived therapeutic efficacy were also reported to be as important reasons for compounded medicines, particularly, in hospitals' settings. The results of several studies revealed that between 15% and 80% of all medications used in hospitalized children have either not been licensed or used outside the specification terms of the product license.[10-11] Although, most of published studies in the literature examined the frequency, nature, extent, quality and efficacy of extemporaneous compounding were limited to community pharmacies[9-12], however, few studies addressed these aspects related to extemporaneous compounding in hospital pharmacies.[13-17] Because of the conflicting data about the frequency, nature, extent, standards, direction and attitudes towards of extemporaneous compounding and lack of studies that address this issue in our hospital pharmacies, therefore we carried out this study with the aim to:

- Determine the frequency, nature, and extent of extemporaneous compounding in hospital pharmacy settings.
- Examine the Reasons for an extemporaneous compounding to be prescribed.
- Assess therapeutic safety and efficacy of extemporaneously compounded products.
- Determine the attitudes and opinion of the hospital pharmacists towards the quality of their ingredients and equipment used in compounding as well as other aspects related to extemporaneous prescription compounding.
- Determine levels of confidence and professional satisfaction with extemporaneous compounding.

- Determine constrains and factors that may influence hospital pharmacists inability to immediate compounding or refrain to provide such service.
- Describe views, believes and attitudes about past and future of extemporaneous prescription compounding.

MATERIALS AND METHODS

Design: The self-completion questionnaires used in this study was described in the first article of the series.[1] A cross-sectional survey was designed to collect information on hospital pharmacists' attitudes to issues related extemporaneous dispensing. It consisted of four sections. The first section consisted of demographic and other background data. The second section included questions on the nature and extent of extemporaneously compounded products and their therapeutic efficacy. The third section asked questions about the conditions and standards of equipments, raw materials, reasons for compounding, and constrains for inability to compound as well as factors that inhibit pharmacists not compound. The fourth section consisted of questions about respondents' attitude toward extemporaneous compounding, desire for training, self-confidence in preparing compounded products and the extent degree of confidence and professional satisfaction with extemporaneous compounding. Also questions about the perceived past and future of extemporaneous prescription compounding were incorporated. The questionnaire was extensively reviewed and piloted, in ten pharmacists. Accordingly, further modifications were made in the questionnaire, Then the piloted questionnaire was distributed to the targeted pharmacists.. Feedback to most question was measures based on a five-point Likert scale (1-5). Certain questions were also permitted to select "yes", "no and don't know. Socio-demographic of the respondents was also collected. These include, gender, age, qualifications, post-qualification experience, occupation and hospital affiliation.

Selection criteria

Inclusion criteria: Surveys were included if hospital whether public or private having more 200 inpatient beds or having at least one full time pharmacist, with satisfactory completion of all sections of the questionnaire. Also, if the department of pharmacy located within the premises of the hospital service both inpatients and outpatients.

Exclusion criteria: Surveys were excluded, if questionnaire is not satisfactory completed the four sections. Also, affiliation of hospital pharmacy department to community pharmacy as the case in much private hospitals was also considered as exclusion criteria.

Study sample

A stratified random sample of hospitals throughout Khartoum city-capital of Sudan was selected for this study. The strata were hospital size (Large/small) and affiliation (private, public, military and university). Initially a list 30 public and 6 private hospitals met the selecting criteria were chosen for the survey. Hospitals with over 200 available inpatient beds were determined to be the target of the study. Finally a sample of 10 public hospitals and two private hospitals (every third hospital), one military, one university was decided upon. Initial telephone was carried out to determine the population of pharmacists in each targeted hospital. Accordingly the sample size requirement was estimated to be 200 out of list of 600 hospital pharmacists working in the targeted hospitals (every three pharmacists).

Distribution

The questionnaires were distributed to all pharmacists employed at the hospital targeted. This was followed up for collection on a later date that ranged from two to eight weeks. All completed questionnaires were requested to be returned anonymously. The questionnaires were distributed on different occasions. Data collection was performed from December 2015 to March 2016.

Data analysis

Retrieved and usable copies of the questionnaire were entered in Microsoft Excel and crosschecked for accuracy before sorting and loaded on SPSS version 20. The average score for each sub group of items was calculated on Likert scale that ranged from 1 to 5. Percentage frequency distribution responses were also calculated.

Possible associations and cross correlation between socio-demographic variables and certain attitudes of pharmacists towards certain aspects of extemporaneous compounding were explored using the chi-square independent test. The demographic characteristics data used for association and cross correlation were gender, ages, qualification, post-qualification experience, and hospital affiliation and employee.

RESULTS

The survey achieved a reasonable response rate of 60% (120/200). The majority of respondents were female (75.2%), while male account for 24.8% of the respondents. About 63.6% of respondents were aged less than 30 years and about similar proportions (68.3%) had B Pharm. Half of respondents (50%) had five years or less of post-qualification experience in

pharmacy settings. Detailed of demographics characteristics and background information of respondents are presented in Table-1. Not all data in some tables count up to 100% because of missing values.

Number of extemporaneous prescriptions for compounding received per week

When respondents were asked to indicate the weekly average number of extemporaneous prescriptions that they were received for compounding, 40 (36.3%) of respondents stated that they were received no prescriptions. 31 (28.2%) of respondents were received 1-5 prescriptions, 15 (13.6%) were received 6-10 prescriptions for compounding, 4 (3.6%) 11-15 prescriptions and 11 (10%) of respondents were received 10-20 prescriptions, only minority proportion of respondents 01 (0.9%) were received 21-25 prescriptions and 6 (5.6%) were received 20-30 prescriptions. The frequency of compounded drugs relative to all dispensed prescriptions was 3-5% (4%) for 45.2% of pharmacists, whereas, the rest was <1% for 15 (17.9%), 1-2% for 10 (11.9%), and 6—8% and 9-11% for 8 (9.5%) and 04 (4.8%) of pharmacists, respectively, while 12% and over for 10 (8.3%) of pharmacists. An estimated frequency and percentage of the average weekly dosage forms that were compounded and non-compounded are shown in Table-2 and figuer–2 and figure-.3. Dermatological and internal dosage forms were among the most popular preparations requested for compounding.

Because respondents may have difficulty in estimating exactly how much time they spent in compounding per episode, respondents were requested to give a time range rather than a single average value. The estimated average time spent in extemporaneous preparations indicated was 1-5 minutes by 6 (6.8%) of respondents, 6-10 minutes by 24 (27.3%) of respondents, 11-15 minutes by 31 (35.2%), while 16-20 and over 20 minutes by 14 (15.9%) and 13 (14.8%) of the respondents, respectively see figure-1.

Respondents were also asked to state who was involved in compounding prescriptions requested for extemporaneous compounding, most of the respondents 66 (55%) stated that it was often or very often the pharmacist receiving the prescription who prepared it, 42 (35%) stated that pharmacist never involved in compounding and minority of respondents 4 (3.3%) indicated that pharmacist are rarely engaged in compounding, while only 8 (6.7%) stated that sometimes the pharmacist is involved Table-3., However, for those hospital pharmacies with technicians, 18 (15%) of respondents indicated that they often or very often used a dispensary technician and 17 (14.2%) sometimes, while, 17 (14.2%) of respondents rarely technician were involved in compounding, and minority 4 (3.3%) indicated that technician never

involved in compounding. Furthermore, 1(0.8%) of respondents mentioned that often or very often other persons (like trainee pharmacist or pharmacists in other pharmacies) were involved in compounding, 1 (0.8%), sometimes, 4 (3.3%) rarely and 114 (95%) never. On the other hand, when the respondents were asked to indicate who is the most common prescriber of extemporaneous prescriptions, 62 (51.7%) of respondents stated that they often or very often received prescriptions from dermatologist, 11 (9.2%) sometimes, 18 (15%) rarely, and 29 (24.2%) never with an average score of 3.25, whereas, 21 (17.5%) of respondents indicated that they often or very often they received prescriptions from general practitioners (GP), 24 (20%) sometimes, 35 (2.2%) rarely 40 (33.3%) never with an average score of 1.31. Pediatricians had an impact on respondents' response similar to that of GPs, where, 21 (17.5%) of respondents stated that they often or very often received prescription from pediatrician, 13 (10.8%) sometimes, 41 (34.2%) rarely and 45 (37.5%) never with an average score of 1.18. Whereas, 7-16% of respondents indicated that they often or very often received extemporaneous prescriptions from other types of prescribers (see Table-3).

Type of Water used in compounding

When respondents were asked what type of water they frequently use when requested to prepare an extemporaneous product, 3 (2.5%), 0ften, 5 (4.3%) sometimes, 24 (20%) rarely used tap water, while, 88 (73.3%) stated that they never used tap water, only, 5 (4.1%) of respondents indicated that they often and very often used tap water boiled and cooled , 27 (22.5%) sometimes, 24 (20 %), rarely and 68 (53.3%) never used boiled and cooled water. On the other hand, 12 (10%) often or very often used freshly cooled water taken directly from water distiller, 47 (39.2%) sometimes, 10 (8.3%) rarely and 51 (42.5%) never. However, with regard to sterile water, 59 (47.5%) of responded often or very often used sterile water, 16 (13.3%) sometimes, 8 (6.7%) rarely and 39 (32.5%) never.

Prescribing reasons for deciding to compound

Respondents were asked to describe their views regarding the reasons for extemporaneous requests. The results represented in Table-4 showed that there are multiple reasons in favor of extemporaneous prescription compounding that are endorsed by the great majority of respondents. These include.

a. Product not commercially (53%).
b. Pediatric strength (42%) was not commercially available.
c. Official preparations were recommended (41%).

On the other hand, between 16 and 34% also respondents cited other reasons for extemporaneous prescribing. These include patient had unique condition; particular geriatric strength was recommended; product compounded according patient's or physicians demand.

An assessment of the influence of socio-demographic characteristics of the respondents on their attitudes towards all reasons were tested using inferential statistical analysis, showed that gender (p=0.225), age (p=0.079) and post-qualification experience (p=0.338), were all had no significant influence, while, only qualification of respondents and hospital affiliation were significantly associated with pharmacists' attitudes towards all reasons with p-value =0.033 for both variables. Furthermore, correlation between demographic characteristics and all reasons were calculated and results were shown on Table-5. The Correlation coefficient (r) showed that those respondents having master degree of clinical pharmacy had significantly higher positive weak correlation on their attitudes towards all reasons than their other counterparts (r values = 0.235). Also those working in other hospitals (like, Ministry of interior Hospital) had significant impact on (r values = 0.135) on all reasons than those respondents working in other practice settings.

Perceived efficacy of extemporaneously compounded products

To assess the therapeutic efficacy and safety of proportion of prescribed extemporaneously compounded products, respondents were asked to indicate how therapeutically safe and effective the extemporaneous products they prepared, 36.7% of respondents felt that extemporaneous products are high or very high therapeutically appropriate, however in contrast only 5% of respondents felt that extemporaneous compounded products were therapeutically inappropriate, whereas, 19.2% felt that they are highly safe, but had unproven efficacy, only 5% of the respondents thought that efficacy of extemporaneously prepared products were controversial see Table-6.

Equipments and layout space for compounding area

Equipments

The correct equipment is important when prescriptions requested for extemporaneous compounding. Many pharmacy boards in different countries have a required minimum list of equipments for compounding prescriptions with specific standard conditions. These equipments are varied according to the amount of material needed and the type of compounded prescription. To accord with these specifications, respondents surveyed were asked to rate the standards conditions of range of equipments necessary for extemporaneous

prescription compounding. Detailed of equipments and other aspects related to dispensing scales are shown in Table-7. The majority of respondents were rating the conditions of their equipments and balances to be low or very low. However, with regard to dispensing scales, about half of respondents (53.2%) reported that the conditions of their scales were low or very low. Also, when respondents were asked to state the level of certain aspects relating to their dispensing scales, such as the levels of working bunches cleanliness of the area, sensitivity and accuracy of their scales. About 49.4% of respondents thought them as low or very low, 29.9% as moderate, 13.8% as high or very high and minority of the respondents (6.9%) did not know. However, a similar picture appears with the state of cleanliness of the area, where, 49.4% of respondents viewed them as low or very low, 29.9% as moderate, 13.8% as high or very high and minority of the respondents (6.9%) did not know. On the other hand, with regard to the sensitivity and accuracy of scales, 47.6% and 32.9% considered them as low or very, 7.1% and 8.2% did not know about the sensitivity and accuracy of their scales, respectively.

Compounding area

According to pharmacy and poisoning regulation, pharmacies actively involved in compounding have to dedicate a separate area in the pharmacy to this process. The area must have enough space to work comfortably and store all chemical and equipments. To assess the adequacy of respondents' compounding areas, respondents were asked to describe how adequate their compounding areas, more than half or respondents (53.4%), viewed it as inadequate or very inadequate, 38.4% considered it as adequate or more than adequate, whereas, only 8.2% of respondents did not know. Also, when respondents were asked to what extent their compounding areas were supplied with the necessary equipments in both size and type, 45.9% respondents rated them as low or very low. 39.2% moderate and only 14.9%% sought them as high or very high (Table-8).

Conditions of raw ingredients stocked

To assess the condition of raw materials, respondents were given four statements about the conditions of materials used in compounding. The response to these questions was summarized in Table-8. When respondents were asked to indicate to what extent do the range of ingredients they stock deal with the demand of variety of extemporaneous requests they received for compounding in their pharmacies, 40% of respondent viewed them as moderate, (with total score of approximately 3.0), 32.5% described them as low or very low and only

27.2% as high or very high. Respondents also were asked about their self-confidence in the quality of ingredients they use, 39.2% of respondents rated it as moderate, (with total score of approximately 3.0), and 31.6% as high or very high, while 29.2% consider it as low or very low. Furthermore, respondents were asked to describe the level ingredients they stock that having expiry date, 77.5% of respondents rated them as low or very low, 9.2% as moderate, 10% as high or very high, whereas, 13.3% of respondents stated that they did not know. For ingredients with expiry date, respondents were requested to indicate how frequently they check their ingredients against expiry date. About 35.8% of respondents stated that they checked them immediately prior to use, 34.5% check them for expiry date every 1-3 months, while only 3.3% and 0.8% respondents checked them every two or more than two years, respectively.

Situations that influence the inability of pharmacists to compound

Respondents were asked how frequently a given list of statements which frequently occurred that led them to either direct the patients to return next day or referred to other community pharmacy. The results were shown in Table-9. Although the trend in majority of statements is toward disagreement with the listed statements, however, the results of the survey showed that the most of statements that could have a major influence in ability of the pharmacist to dispense compounded products were Lack of ingredients and Lack of time. Other facts or beliefs that would be appear smaller but yet have a significant influence in dissuading respondents from extemporaneous compounding include: lack of references, lack of expertise in compounding and availability of inadequate weighing and scales as well as inadequate storage containers.

Factors that influenced respondents' attitudes to inhibit from compounding

There are various factors exist that could influence pharmacists' attitudes towards statements about factors against deciding not to compound. Respondents' attitudes to the statements about deciding not to compound were summarized in Table-13. The results showed that there are a number of factors that could have a major influence in inhibiting the pharmacist to compound. The most often important of these factors were inadequate availability of dispensing equipments (40%), Lack of expertise in field of compounding (35.7%), time taken in compounding (35.7%) and Lack of information about stability and efficacy of many extemporaneous preparations (30.9%). On the other hand, other factors that would further influence in dissuading pharmacist from compounding were inadequate payment (22.5%),

unknown safety of extemporaneous products (22.5%), Questionable quality of ingredients (22.7), standard of extemporaneous product is lower than commercial product (25.3%), unknown bioavailability and efficacy of extemporaneous products (23.3%).

Opinion of respondents towards extemporaneous compounding

The opinion of hospital pharmacists to a list of several professional attitudinal statements are summarized in Table-11. With regard to the need for maintenance of extemporaneous compounding, the results of the study showed that the great majority of respondents (49.6%) believed, that the demand for extemporaneous compounding had been decreased or greatly decreased in over the past few years, whereas, about 20.9% felt it remained within the same level and 19.1% felt it had increased or greatly increased and only 10.4% of respondents did not know.

With respect to the future prospects of extemporaneous prescription compounding, 52.2% of the respondents believed the future demand for extemporaneous dispensing would be decreased or greatly decreased, 33.9% of respondents felt that it would be increased or greatly increased, while 5.2% of respondents considered it would be the same and only 8.7% of respondents did not know. Also, respondents were asked to describe the rate of their skills in compounding since they were graduated, more than half of the respondents felt that their skills increased or greatly increased, 28.3% of respondents believed that it is decreased or greatly decreased, 15.9% stated that it remain the same and only minority of respondents (1.8%) did non know.

Respondents were also asked to state the level of confidence in their ability to prepare extemporaneous products about 48.7% of respondents indicated that their confidence were high and very high, while, 35.9% consider it as moderate, and only 15.4% considered it as low or very low with an average score of 4.00. However, with respect to professional satisfaction in preparing extemporaneous compounding, 39.7% of respondents reported high and very high, about 37.9% accounted moderate and 22.4% of respondents considered it as low with an average score of 3.

Attitudes towards the past and future of extemporaneous compounding

When respondents were asked to indicate on the light of the present situation, should extemporaneous prescription compounding remain as task to be performed by all pharmacists?, majority of respondents (58.9%), agree or strongly agree, 20.5% of respondents

were neutral and only 17.9% were disagree or strongly disagree, Also when respondents were asked whether the profession should abandon its traditional role in compounding, 41% of respondents were disagree or strongly disagree, while equally 41% of respondents were neutral and only 17.4% were agree or strongly agree. A different picture were emerged when respondents were asked for the option regarding specialized pharmacist to handle extemporaneous compounding, more than half of the respondents (56.8%) disagree or strongly disagree, while 35.6% were neutral and only 7.6% agree. On the other hand, when respondents were asked to indicate their attitudes towards the need for periodical assessment of all pharmacists in their skills in extemporaneous compounding, 71,2% were agree or strongly agree, while 16.1% were neutral and only 11.8% were disagree or strongly disagree. Assessment of the influence of socio-demographic characteristics of the respondents on their attitudes towards extemporaneous compounding was illustrated bcTable-13. Furthermore, correlation between socio-demographic characteristics of the respondents on their above mentioned attitudes towards extemporaneous compounding was calculated for each attitudes and the results was shown in Table-14.

With regard to Interest in and need for more emphasis in training, about half (50.7%) of respondents felt their undergraduate training did not equipped with the necessary skill and knowledge to cope with extemporaneous compounding, further half of the respondents felt that their preparation were inadequate or very inadequate, 35.2% felt that were adequate or more adequate, while 13.7% did not know. Overwhelming proportion of respondents (73.8%) believed that a refreshing course in extemporaneous compounding is useful or very useful. Likewise, 31.7% of respondents felt that more emphasis should be placed in undergraduate training, while 40.2% did not know, and only 28.5% felt inadequate or very inadequate Table-12. Details of association and correlation between socio-demographic characteristics of the respondents on the above mentioned statements were presented in Tables, 13 and 14, respectively.

Table. 1: Demographic characteristics of the respondents (120).

Demographic characteristics	Number responded	Percent	SD
Gender			0.43
Male	29	24.8	
Female	91	75.2	
Ag (yr)			0.89
< 30	77	63.6	
30-39	27	22.3	
40-49	08	06.6	
50 and over	08	06.6	
Qualifications			0.65
B Pharm	82	68.3	
M Clin Pharm	31	25.8	
M Pharm	5	4.2	
Others	2	1.7	
Experiences			1.03
5 years or less	60	50.0	
6-10 years	30	25.0	
10-20 years	17	14.2	
Over 20 years	13	10.8	
Employee			0.94
Directors	62	51.2	
Assistant directors	13	10.7	
Pharmacists	45	37.2	
Hospital's affiliation			1,12
Private	16	13.3	
University	16	13.3	
Military	11	09.2	
Ministry of health	77	64.2	
Others	01	00.8	
Size of the hospital			2.13
199 and less	16	13.6	
200-299	3o	25.5	
400-499	30	25.7	
C500-599	17	14.4	
600 and over	24	20.3	

Table. 2: Extemporaneous compounded and non-compounded dosage forms.

Dosage forms	Compounded N(%)	Non-compounded N(%)
Internal preparations		
Liquids	79 (65.8)	041(34.2)
Suspensions	40 (33.3)	080 (66.7)
Emulsions	41 (34.2)	079 (65.8)
Rectal	26 (21.7)	094 (78.3)
Powder	17 (14.2)	103 (65.8)
Total parenteral nutrition (TPN)	02 (17.9)	118 (98.3)
IV admixture	03 (02.5)	117 (97.5)
Others	06 (05.0)	114 (95.0)
External preparations		
Ointments	51 (42.5)	069 (57.5)
Creams	51 (42.5)	069 (57.5)
Lotions	39 (32.5)	081 (67.5)
Powders	32 (26.7)	088 (73.3)
Others	35 (29.2)	085 (70.8)
Ear/Nose/Throat (ENT) preparations		
ENT drops	37 (30.8)	083 (69.8)
Powder	20 (18.7)	100 (83.3)
Others	12 (10.0)	108 (90.0)

Table. 3: Compounder and Prescriber of extemporaneous compounding.

	Never N (%)	Rarely N (%)	Sometimes N (%)	Often N (%)	very often N (%)	Average score [a] (SD)*
Compounder						
Pharmacist	42 (35.0)	04(03.3)	08(06.7)	10(08.3)	56 (46.7)	**2.30 (1.84)**
Technician	68 (56.7)	17 (14.2)	17 (14.2)	13 (10.8)	05 (04.2)	**0.92 (1.23)**
Others	114 (95.0)	O4(03.3)	O1(0.80)	------	01(0.80)	**0.08 (0.44)**
Prescriber						
General practitioner GP)	40 (33.3)	35 (22.2)	24 (20.0)	10 (08.3)	11 (09.2)	**1.31 (1.20)**
Dermatologist	29 (24.2)	18 (15.0)	11 (09.2)	18 (15.0)	44 (36.7)	**2.25 (1.64)**
Pediatrician	45 (37.5)	41 (34.2)	13 (10.8)	09 (07.5)	12 (10.0)	**1.18(1.34)**
ENT specialist	50 (41.7)	28 (23.2)	29 (24.2)	07 (05.8)	06 (05.0)	**1.09 (1.21)**
Surgeon	55 (45.8)	24 (20.0)	25 (20.8)	09 (07.5)	07 (05.8)	**1.08(1.30)**
Dentist	73 (60.8)	24 (20.0)	16 (13.3)	01 (0.80)	06 (05.0)	**0.69(1.10)**
Others specify	91 (75.8)	07 (05.8)	10 (08.3)	11 (09.2)	01 (0.80)	**0.53 (1.10)**

[a]Scores: Never=0, Rarely=1, Sometimes=2, 0ften=3 Very often=4, * Standard deviation

Table. 4: Reasons for extemporaneous products preparations.

Reasons	Never N(%)	Rarely N(%)	Sometimes (%)	Often N(%)	Very (%)	Average score (SD)*
To prepare pediatric strength	26 (21.7)	33 (27.7)	19 (15.8)	21 (17.5)	21 (17.5)	1.82 (1.41)
To prepare geriatric strength	48 (40.0)	16 (13.3)	32 (26.7)	13 (10.8)	11 (09.2)	1.36 (1.35)
Product not commercially available	28 (23.3)	19 (15.8)	20 (16.7)	20 (16.7)	33 (27.7)	1.36 (1.54)
Strength not commercially available	54 (45.0)	10 (08.3)	29 (24.2)	12 (10.8)	14 (11.7)	1.33 (1.44)
Patient with unique condition)	41 (34.2)	10 (08.3)	44 (36.7)	08 (06.7)	17 14.2)	1.60 (1.40)
Hypersensitivity to commercial products	53 (44.2)	25 (20.8)	26 (21.7)	06 (05.0)	10 (08.3)	1.13 (1.27)
Patient's demand	49 (40.8)	15 (12.5)	22 (18.3)	17 (14.2)	17 (14.2)	1.48 (1.50)
Physician's demand	27 (22.5)	19 (15.8)	42 (35.0)	13 (10.8)	19 (15.8)	1.81 (1.50)
Official preparation	31 (25.8)	19 (15.8)	29 (24.2)	23 (19.2)	18 (15.0)	2.24 (1.40)
Product similar to commercially available one, but offers lower cost	36 (30.0)	23 (19.2)	32 (26.7)	19 (15.8)	10 (08.3)	1.53 (1.30)
Mask the taste of particular product	62 (51.7)	22 (18.3)	19 (15.8)	05 (04.2)	12 (10.0)	1.03 (1.33)
Prepare product from tablets and capsules when the pure active ingredients is not available	48 (40.0)	16 (13.3)	17 (14.2)	22 (18.3)	17 (14.2)	1.53 (1.51)
Special-dose –needed	72 (60.0)	12 (10.0)	11(09.2)	12 (10.0)	13 (10.8)	1.02 (1.42)

[a] Scores: Never=0, Rarely=1, Sometimes=2, 0ften=3 Very often=4, * Standard deviation

Table. 5: Association and Correlation between socio-demographic variables and reasons.

	P=values	Results	Significance
Gender	o.115	There Is no association	Ns
Age	0.079	There is no association	Ns
Post-qualification Experience	0.336	There is no association	Ns
Qualification	0.033	There is an association	Sg
Hospital affiliation	0.033	There is an association	Sg
	Correlation Coefficient (r)	Results	Significance
Qualification			
B- Pharm.	-0.242	There Is negative weak correlation	Ns
M Clin Pharm.	0.235	There is a positive weak correlation	Sg
M- Pharm.	0.094	There is no correlation	Ns
Others	-0.072	There is no correlation	Ns
Hospital affiliation			
Private	0.069	There is no correlation	Ns
University	0.050	There is no correlation	Ns
Military	0.096	There is no correlation	Ns
Mastery of Health	-0.139	There a negative weak correlation	Ns
Others	0.135	There is a positive weak correlation	Sg

P = probability sg= $p<0.05$

Table. 6: Perceived efficacy of extemporaneously compounded products.

Product described as	Very low N(%)	Low N(%)	Moderate N(%)	High N(%)	Very high N(%)	Don't know N(%)	Average score [a]D)*
Therapeutically appropriate	23 (19.2)	05 (04.2)	17 (14.2)	32 (26.7)	12 (10.0)	31 (25.8)	**4.00 (1.55)**
Probably safe, but unproven Efficacy	26 (21.7)	15 (12.5)	16 (13.3)	23 (19.2)	----------	40 (33.4)	**4.00(1.63)**
Controversial	33 (27.5)	13 (10.8)	27 (22.5)	03 (02.5)	03 (02.5)	41 (34.2)	**3.44 (1.60)**
Therapeutically inappropriate	50 (41.7)	11 (09.2)	09 (07.5)	02 (01.7)	04 (03.3)	44 (36.7)	**3.26 (1.65)**

[a] Scores: Very low=1, Low=2, Moderate=3, High=4 Very High=4 * Standard deviation

Table. 7: Conditions of dispensary equipment, dispensing scales and their Standard.

Items	Very low	Low N (%)	Moderate N (%)	High N (%)	Very high N (%)	Don't know
Condition of dispensing equipments						
Pan Small balance	32 (37.2)	13 (15.1)	17 (19.8)	05 (05.8)	17 (19.8)	02 (02,3)
Large pan balance	28 (34.1)	22 (26.8)	20 (24.4)	07 (08.5)	03 (03.7)	02 (02,4)
Dispensing weight	24 (28.2)	14 (16.5)	17 (20.0)	17 (20.0)	07 (08.2)	06 (07.1)
Measuring cylinders (glass/plastic)	16 (18.4)	26 (29.9)	15 (17.2)	18 (20.7)	08 (09,2)	04 (04.6)
Mixing vessels	24 (27.6)	06 (06.9)	31 (35.6)	17 (19.5)	05 (05.7)	04 (04.6)
Stirring rods	24 (29.6)	08 (09.9)	32 (39.5)	10 (12.3)	04 (04.9)	03 (03.7)
Spatula*	31 (36.9)	06 (07.1)	21 (25.0)	20 (23.8)	03 (03.6)	03 (03.6)
Mortar and pestle (glass)	37 (45.1)	05 (06.1)	18 (22.2)	12 (14.6)	04 (04.9)	06 (07.3)
Mortar and pestle (Porcelain)	17 (19.5)	03 (03.4)	26 (29.9)	20 (23.0)	13 (14.9)	08 (09.2)
Heating equipments	19 (22.1)	02 (02.3)	36 (41.9)	15 (17.4)	06 (07.0)	08 (09.3)
Sterilization equipments	39 (45.9)	01 (01.2)	22 (25.9)	12 (14.1)	03 (03.5)	08 (09.4)
Aspects related to dispensing scales						
Level with bunch	34 (39.1)	09 (10.3)	26 (29.9)	06 (06.9)	06 (06.9)	06 (06.9)
Cleanliness	22 (29.9)	10 (10.3)	24 (29.9)	13 (06.9)	10 (06.9)	05 (06.9)
Sensitivity of scales	23 (27.4)	17 (20.2)	17 (20.2)	14 (16.7)	07 (08.3)	06 (07.1)
Accuracy of scales	21 (24.7)	07 (08.2)	28 (32.9)	14 (16.5)	08 (09.4)	07 (08.2)

Scores: Very low=1, Low=2, Moderate=3, High=4 Very High=5 * Standard deviation

Not all data count to 100% because of missing values

Table. 8: Pharmacists' opinions to some aspects related to extemporaneous compounding.

Statements	**Very low N (%)**	**Low N (%)**	**ModerateN (%)**	**High N (%)**	**Very high N (%)**	**Don't know N (%)**	**Average score[a]SD)***
To what extent the compounding area is supplied with necessary equipments in both size and type?	23 (19.2)	32 (26.7)	47 (39.2)	17 (14.2)	01 (0.70)		**3.00 (0.99)**
To what extent do the range of Ingredients you stock deal with the demand of variety of extemporaneous requests?	23 (19.2)	16 (13.3)	48 (40.0)	33 (27.5)	---------		**3.00 (1.06)**
What is level of confidence in the quality of ingredients you use?	23 (19.2)	12 (10.0)	47 (39.2)	36 (30.0)	02 (01.6)		**3.00 (1.11)**
What is the level of ingredients you stock having expiry date?	37 (30.8)	44 (46.7)	11 (09.2)	07 (05.8)	05 (04.2)		
Statements	**Very inadequate N (%)**	**Inadequate N (%)**	**Don't know N (%)**	**Adequate N (%)**	**More adequate N (%)**		**Average score SD)***
How adequate the space of compounding?	35 (29.2)	29 (24.2)	10 (08.2)	32 (26.7)	14 (11.7)		**3.00 (1.43)**
What is the level of ingredients you stock having expiry date?	37 (30.8)	44 (46.7)	11 (09.2)	07 (05.8)	05 (04.2)	16 (13.3)	**3.00 (1.70)**
Statement	**Rarely**	**Prior to use**	**Every 1-3 months**	**Every 4-12 months**	**Every 2 years**	**More than 2 years**	
How regularly do you undertake ingredient stock control	20 (16.7)	43 (35.8)	41 (34.2)	11 (09.2)	04 (03.3)	01 (0.80)	

[a] Scores: Very low=1, Low=2, Moderate=3, High=4 Very High=5 * Standard deviation

[a] Scores: Very inadequate=1, Inadequate=2, Don't know=3, Adequate=4 More adequate=5

Table. 9: Constrains that inhibit ability of pharmacists to immediate dispense compounding.

Statements	Never N (%)	Rarely N (%)	Sometimes N (%)	Often N (%)	Very often N (%)	Average score[a] (SD)*
Lack of ingredients	32 (26.7)	15 (12.5)	43 (35.8)	10 (08.3)	20 (16.7)	**2.00(1.22)**
Inadequate mixing equipments	60 (50.0)	14 (11.7)	21 (17.5)	20 (16.7)	05 (04.2)	**1.13 (1.30)**
Inadequate weighing and scales	61 (50.8)	24 (20,0)	12 (10.0)	09 (07.5)	14 (11.7)	**1.11 (1.31)**
Inadequate storage containers	63 (52.5)	16 (13.3)	20 (16.7)	14 (11.7)	07 (05.8)	**1.05(1.31)**
Lack of time	39 (32.5)	32 (26.7)	30 (25.0)	09 (07.5)	10 (08.3)	**1.33 (1.30)**
Lack of appropriate references	39 (32.5)	45 (37.5)	13 (10.8)	18 (15.0)	05 (04.2)	**1.21(1.15)**
Lack of expertise in compounding	63 (54.2)	18 (15.0)	10 (08.3)	14 (11.7)	14 (11.7)	**1.13 (1.30)**
Others specify	73 (60.8)	03 (02.5)	14 (11.7)	17 (14.2)	13 (10.8)	**1.12(1.51)**

[a]Scores: Never=0, Rarely=1, Sometimes=2, 0ften=3 Very often=4, *Standard deviation.

Table. 10: Factors that influence pharmacist's attitudes towards extemporaneous compounding.

Statements	Very low N (%)	Low N (%)	Moderate N (%)	High N (%)	Very high N (%)	Average score[a] (SD)*
Inadequate payment for extemporaneous products	34 (30.6)	29 (26.1)	23 (20.7)	18 (16.2)	07 (06.3)	**2.41(1.25)**
Lack of practice in area of compounding	13 (11.6)	26 (23.2)	33 (29.5)	27 (24.1)	13 (11.6)	**3.03 (1.20)**
Time taken in preparation of compounded products	13 (11.3)	26 (23.2)	33 (29.5)	27 (24.1)	13 (11.6)	**3.03(1.10)**
Lack of information about stability,	15 (13.6)	33 (30.0)	28 (25.5)	23 (20.9)	11 (10.0)	**3.00(1.24)**
Inadequate availability of dispensing equipments	19 (17.3)	18 (16.4)	29 (26.4)	30 (27.3)	14 (12.7)	**2.15(1.30)**
Questionable quality of ingredients used	31 (28.2)	20 (18.2)	34 (30.9)	20 (18.2)	05 (04.5)	**3.00 (1.21)**
Standard of extemporaneous products is lower than for commercial products	16 (14.5)	23 (20.9)	42 (38.2)	24 (21.8)	05 (04.5)	**3.00 (1.10)**
Unknown bioavailability or clinical efficacy of extemporaneous products.	21 (18.8)	31 (27.7)	34 (30.4)	19 (17.0)	07 (06.3)	**3.00 (1.15)**
Unknown safety of extemporaneous products	27 (24.3)	31 (27.9)	28 (25.2)	18 (16.2)	07 (06.3)	**3.00 (1.21)**

[a] Scores: Very low=1, Low=2, Moderate=3, High=4 Very high=5 * Standard deviation.

Table. 11: Pharmacist opinions to some aspects related to extemporaneous compounding.

Statements	Greatly decreased N (%)	Decreased N (%)	The same N (%)	Increased N (%)	Greatly increased N (%)	Don't know N (%)	Average score (SD)*
Over last few years, since graduation, how do you describe the trend in extemporaneous compounding?	18 (15.7)	39 (33.9)	24 (20.9)	16 (13.9)	06 (05.2)	12 (10.4)	**3.00 (1.50)**
How do you see the future trend in extemporaneous compounding?	19 (16.6)	41 (35.7)	06 (05.2)	28 (24.3)	11 (09.6)	10 (08.7)	**3.02(1.56)**
How would you describe the rate of your skill in compounding since graduation?	08 (07.1)	24 (21.2)	18 (15.9)	45 (39.8)	16 (14.2)	02 (01.8)	**3.37(1.22)**
Statements	**Very lowN(%)**	**Low N(%)**	**Moderat eN(%)**	**HighN(%)**	**Very high N(%)**		**Average score (SD)***
What is your self-confidence in ability to prepare extemporaneous product?	06 (05.1)	12 (10.3)	42 (35.9)	37 (31.6)	20 (17.1)		**4.0 (1.055**
What is your level of professional satisfaction in preparing extemporaneous product?	11 (09.5)	15 (12.9)	44 (37.9)	35 (30.2)	11 (09.5)		**3.14 (1.082)**

Scores: Greatly decreased=1, Decreased=2, The same=3, increased=4, greatly increased=5 Scores: very low=1, low=2 , Moderate=3, High=4, Very high=5, * Standard deviation

Table. 12: Pharmacists' attitudes towards Past and future of extemporaneous compounding.

Statements	Strongly disagree N(%)	Disagree N(%)	Neutral N(%)	Agree N(%)	Strongly agree N(%)	Average score[a](SD}*
Extemporaneous compounding should be performed by all pharmacists	07 (03.4)	17 (14.5)	24 (20.5)	41 (35.0)	28 (23.9)	4.00 (1.20)
The profession should abandon its traditional role in extemporaneous compounding	37 (31.6)	11 (o9.4)	48 (41.0)	04 (03.4)	17 (14.5)	4.02 (0.15)
Extemporaneous compounding should be handled by specialized pharmacist in the field of compounding	16 (13.6)	51 (43.2)	42 (35.6)	09 (07.6)	_____	2.45 (0.81)
There is a need for periodical assessment of all pharmacists in the skill of extemporaneous compounding	01 (0.80)	14 (11.0)	19 (16.1)	63 (53.4	21 (17.8)	4.00 (0.92)
Statements	**Very inadequate**	**Adequate**	**Don't know**	**Adequate**	**More adequate**	**Average score[a] (SD)***
How do you feel that undergraduate training prepared you to cope with extemporaneous compounding	16 (13.7)	44 (37.0)	16 (13.7)	38 (32.6)	03 (02.6)	3.00 (0.81)
How do you feel that undergraduate should be given an emphasis in the light of present situation	10 (08.9)	22 (19.6)	45 (40.2)	32 (28.6)	03 (02.7)	300 (0.98)
	Ineffective	Of no use	Neutral	Useful	Very useful	
How useful is a refreshing course in extemporaneous compounding [b]	06 (05.1)	07 (05.9)	18 (15.3)	56 (47.5)	31 (26.3)	4.00 (1.05)

[a] Scores: Strongly disagree=1, Disagree=2, Neutral=3, Agree=4 Strongly agree=5 * Standard deviation Sores: Very adequate=1, Adequate=2, Don't know=3, Adequate=4, More adequate=5, *Standard deviation [a] Sores: Very adequate=1, Adequate=2, Don't know=3, Adequate=4, More adequate=5, *Standard deviation

Table. 13: Association between socio-demographic variables and attitudes.

Statements	Gender		Age		Qualification		Experience		Hospital affiliation	
	P	AS	P	AS	P	AS	P	AS	P	AS
Extemporaneous compounding should be performed by all pharmacists	**0.275**	**NA**	**0.004**	**AS**	**0.164**	**NA**	**0.205**	**NA**	**0.000**	**AS**
The profession should abandon its traditional role in extemporaneous compounding	**0.623**	**NA**	**0.000**	**AS**	**0.052**	**NA**	**0.056**	**NA**	**0.037**	**AS**
Extemporaneous compounding should be handled by specialized pharmacist in the field of compounding	**0.337**	**NA**	**0.300**	**NA**	**0.709**	**NA**	**0.243**	**NA**	**0.009**	**AS**
There is a need for periodical assessment of all pharmacists in the skill of extemporaneous compounding	**0.872**	**NA**	**0.028**	**AS**	**0.363**	**NA**	**0.278**	**NA**	**0.000**	**AS**
How do you feel that undergraduate training prepared you to cope with extemporaneous preparation task?	**0.714**	**NA**	**0.056**	**NA**	**0.054**	**NA**	**0.233**	**NA**	**0.000**	**AS**
How do you feel that undergraduate training should be given an emphasis in extemporaneous compounding?	**0.708**	**NA**	**0.532**	**NA**	**0.168**	**NA**	**0.544**	**NA**	**0.001**	**AS**
How useful is a refreshing course in extemporaneous compounding	**0.035**	**AS**	**0.068**	**NA**	**0.125**	**NA**	**0,453**	**NA**	**0.000**	**AS**

P = probability AS = association P<*0.05* NA = No association

Table. 14: Correlation between socio-demographic variables and attitudes.

Correlation between Age and Hospital affiliation and extemporaneous compounding should be performed by all pharmacists					
Age	**r**	**Result**	**Hospital affiliation**	**r**	**Result**
Less than 30	**-0.233**	**Negative weak correlation**	**Private**	**-0.090**	**No correlation**
30-39	**0.035**	**No correlation**	**University**	**-0.244**	**Negative weak correlation**
40-49	**0.125**	**Positive weak correlation**	**Military**	**-0.150**	**Negative weak correlation**
50 and over	**0.268**	**Positive weak correlation**	**Ministry of health**	**0.318**	**Moderate correlation**
			Others	**0.127**	**Positive weak correlation**
Correlation between Age and Hospital affiliation and no need for the profession to abandon its role in compounding					
Less than 30	**-0232**	**Negative weak correlation**	**Private**	**0.048**	**No correlation**
30-39	**0.131**	**Positive weak correlation**	**University**	**-0.180**	**Negative weak correlation**
40-49	**0.127**	**Positive weak correlation**	**Military**	**-0.166**	**Negative weak correlation**
50 and over	**0.102**	**Positive weak correlation**	**Ministry of health**	**0.147**	**Positive weak correlation**
			Others	**0.154**	**Positive weak correlation**
Correlation between Hospital affiliation and extemporaneous compounding should be handled by specialized pharmacist					
Private	**0.008**	**No correlation**			
University	**0.188**	**Positive weak correlation**			
Military	**-0.263**	**Negative weak correlation**			
Ministry of Health	**0.051**	**No correlation**			
Others	**0.164**	**Positive weak correlation**			
Correlation between age, Hospital affiliation and the periodical assessment of all pharmacists in skill compounding					
Less than 30	**0.304**	**Moderate correlation**	**Private**	**0.082**	**No correlation**
30-39	**0.143**	**Positive weak correlation**	**University**	**0.403**	**Moderate correlation**
40-49	**0.284**	**Positive weak correlation**	**Military**	**-0.270**	**Negative weak correlation**
50 and over	**0.055**	**No correlation**	**Ministry of health**	**0.331**	**Moderate correlation**
			Others	**0.144**	**Positive weak correlation**
Correlation between Hospital affiliations How do you feel that undergraduate training should be given an emphasis in extemporaneous compounding?					
Private	**0.137**	**Positive weak correlation**			
University	**-0.085**	**No correlation**			
Military	**-0.210**	**Negative weak correlation**			

Ministry of health	**0.095**	**No correlations**			
Others	**-0.005**	**There is no correlations**			
Correlation between gender, hospital affiliation and How usefulness of refreshing course in extemporaneous compounding					
Male	**-0.179**	**Negative weak correlation**	**Private**	**0.115**	**Positive weak correlation**
Female	**0.179**	**Positive weak correlation**	**University**	**-0.281**	**Negative weak correlation**
			Military	**-0.256**	**Negative weak correlation**
			Ministry of health	**0.270**	**Positive weak correlation**
			Others	**0.000**	**No correlation**

R = Correlation coefficient.

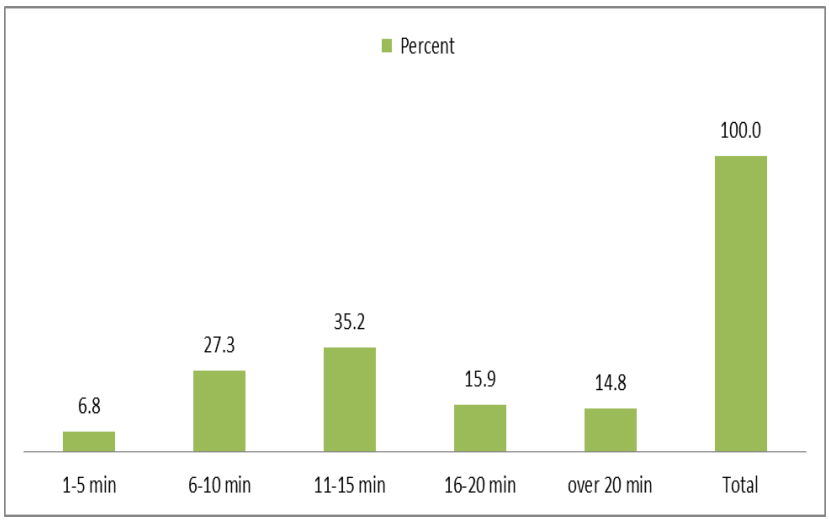

Figure. 1: The Frequency of Compounded and non Compounded products.

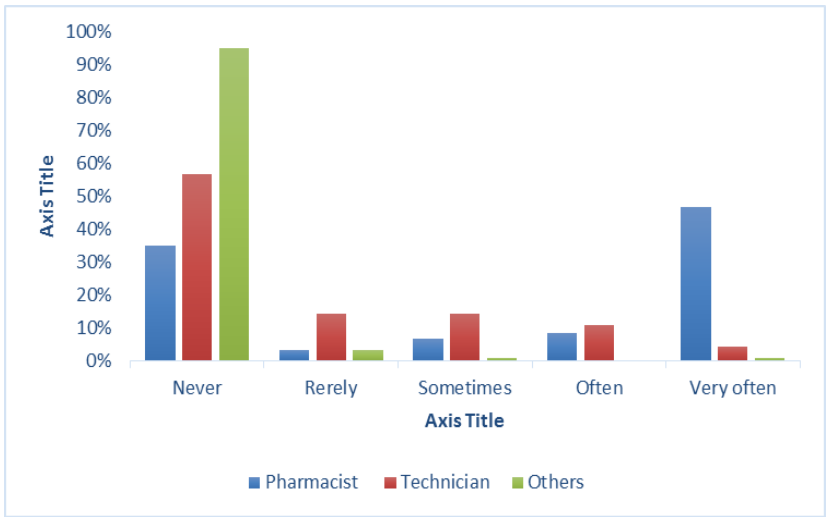

Figure. 2: Frequency of Compounders.

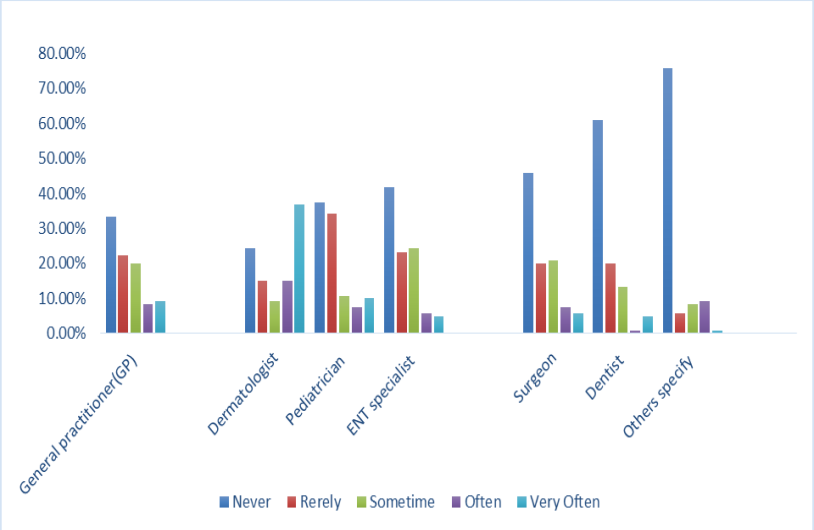

Figure. 3: Frequency of Prescribers.

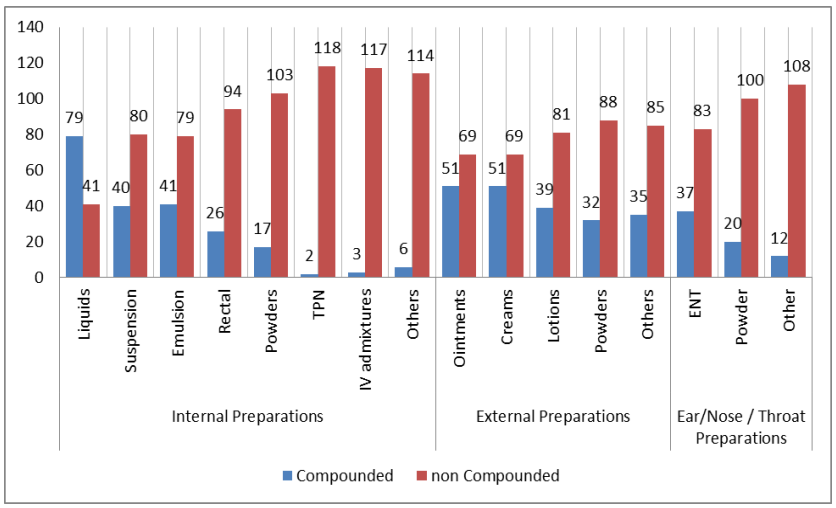

Figure. 4: The Frequency of Compounded and non Compounded products.

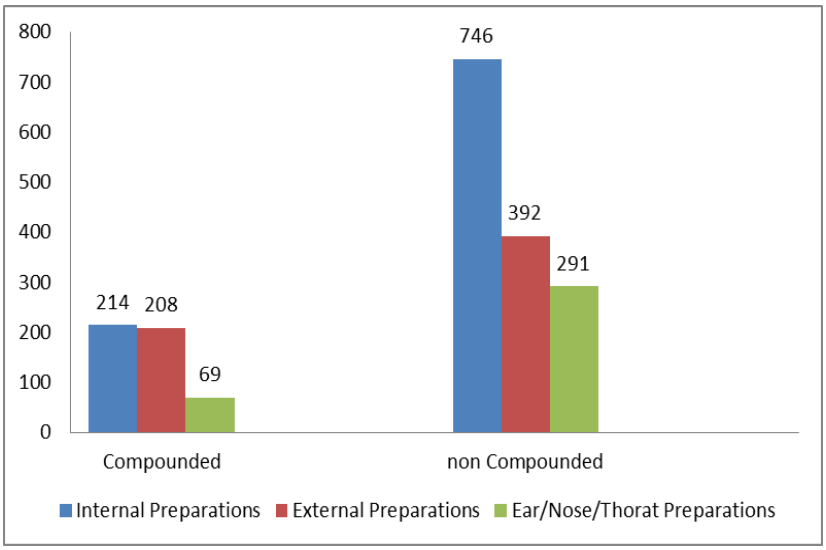

Figure. 6 The Frequency of Compounded and non Compounded products.

DISCUSSION

The study was the second of the series describing the results of national survey of community and hospital pharmacy facilities in Khartoum city. It reports upon a study of hospital pharmacist's attitudes and opinions to extemporaneous compounding and other issues related to compounding. The results of the study revealed that the overall frequency of compounded medicine relative to all dispensed prescriptions was in range of 3-5% (mean of 4%) of all dispensed prescriptions. This finding supported previous report that showed the incidence of extemporaneous prescriptions was in the vicinity of 3.4% (range of o.4-6.8 %).[7] the study also revealed that extemporaneously compounded prescriptions were significantly more often occurs in favor of demagogical products and children dosage forms. The most common prescribers were dermatologist followed by general practitioners and pediatricians. These results are consistent with finding of other studies.[7,9] Although most pharmacists in our study indicated that extemporaneous compounding were continue to decrease, yet, an appreciable number of respondents was very strongly concerned about keeping this service within the vicinity of the profession and should be performed by all pharmacists. Additionally, overall respondents expressed high confidence and professional satisfaction in capability of preparing extemporaneous products. Even though the level of confidence and satisfaction in willingness to compound extemporaneous products was frequently very high among the respondents, there were many barriers that have been identified that hindered the ability of the pharmacists to immediately provide such service. The most common barriers identified in our study were: lack of ingredients, time constrains, lack of supporting information references. Likewise, the absence of therapeutic knowledge and problems associated with the bioavailability and safety of compounded products, were also well thought-out as additional barriers. This weakness can be avoided by conducting well-controlled studies of stability and bioavailability on purified drug with and without expedients should be performed by experience pharmacists and laboratories. Also, professional organization and pharmaceutical manufacturers should make continued efforts to assist pharmacists and medical practitioners in obtaining pertinent information on the compounding and stability of extemporaneous drug formulations.[18]

Furthermore, the reported lack of ingredients as a limit that affected immediate compounding could support the low demand for extemporaneous prescriptions compounding observed in our study. This may be due to difficulty for the pharmacist to stock all ingredients that demanded for diverse of extemporaneous requests or unwilling to spend money in purchasing

raw materials that packaged in large quantities with expiry date. This inadequacy can be overcome by having ingredients packaged by suppliers in small sizes, and frequently check for expiry date and any existing ingredients of doubtful quality or expired should be discarded. On the other hand, some finding in our study are of greater concern, such as lack of knowledge when their scales were last certified for accuracy, absence electric balance, inadequacy of heating and sterilization equipments, rarely check for expiry date on raw materials as well as insufficient dispensary space was. A number of such factors if exist may cause errors that can end to a serious harm to the patient.

The study also revealed that there are multiple reasons why pharmacist performs extemporaneous prescription compounding. The main reasons were cited as: prepare pediatric or geriatric strength that is not commercially available, dispensing compounded product according to demand of the prescriber or patient, special dose needed and unique patient condition such as difficulty in swallowing. These finding were also by pharmacist elsewhere.[7-9]

The feeling of appreciable number of respondents that their skills in compounding remained at the same level since they are qualified as pharmacist and reported a decline in compounding during the few past years, could be a reflection of the high demand for refreshing course in extemporaneous compounding that expressed by majority of respondents. Such retrenching course when sponsored by well trained specialized staff in compounding could enable pharmacists to carry out revision of what they taught in undergraduate study or even more advanced training in extemporaneous compounding. Females, who represent predominantly the respondents, indicated such course will be useful to them. In view of the fact that majority of respondents strongly disagreed about option that extemporaneous compounding should be handled by specialized pharmacist, the responsibility still remained in the playing field of all pharmacists to promote the service to the medical profession to ensure their role as expertise compounder of unique products. Likewise, Lack of standardization of equipments and low sensitivity and accuracy of scales and absence of quality assurance mean that the patients are increasingly faced with array of products that may be questionable in terms of safety and efficacy and may lead to serious adverse effects and even death. Examination of Table-14 showed a significant hospital affiliation effect on respondents' attitudes towards extemporaneous compounding. This because many of these hospitals affiliated to ministry of health are teaching hospitals or have

specialist centers or units and better funded or resourced to provide wide rage of services to patients including extemporaneous compounding. It is also interesting to see that middle aged and older (50 years and over) had an enormous effect on pharmacists' attitudes, than their younger counterparts, this may be due to the fact because they placed more emphasis in this service during their past practice training and need to reflect it to the present situation. Also clinical pharmacists had greater effect on the respondents' attitudes; hence clinical pharmacist by virtue of their clinical role felt that compounding should be kept primarily within the realm of pharmaceutical care. This later is a concern that supports the arguments which suggested that compounded products are needed in certain patient specific situations.[11]

Limitation

Several limitations to this study were existed in our study. Although we plot-tested the survey for comprehension and readability, the questions have not been validated and thus may provide poor measures of targeted attitudes and beliefs. Recall bias may have affected the results and be subjected to inaccuracy. It also assumed that all respondents interpreted the questions in the intended manner, thus the possibility of incorrect interpretation of questions must be considered. The results may not be generalized to all pharmacists in other hospitals pharmacies in the country, due to small size of the Extemporaneous compounding should be performed by all pharmacists sample and limiting the study to Khartoum city ed. These weaknesses are common and inherited in many surveys, and every effort has been made to minimize them.

CONCLUSION

Our finding may provide information that may be useful to the pharmacists and other health care provider as well as health authorities who warranted correcting such situations. Despite the fact, however, extemporaneous compounding constitute a minor part of hospital pharmacy activities, most respondents strongly believed it was unique task that should be performed by all pharmacists. Colleges of pharmacy can also play a crucial role in this regard by placing great emphasis on compounding practice in their curriculum and provide graduates with engorgements and intensive training in order to gain skills in extemporaneous prescriptions compounding and keep the role of the profession in this regard positively within the its vicinity. The results of study highlight on several areas for improvement, however, this weakness can be overcome through ongoing continuing education and periodical assessment

of all practicing pharmacists in compounding skills. Finally, professional association, pharmaceutical manufacturers and other organization as well as pharmacy colleges should promote research and dissemination of pertinent information on extemporaneous formulations for pharmacists and medical practitioners.

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