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Assessment of patients' perception and satisfaction with extemporaneous compounding service in ALERT hospital, Ethiopia

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Abstract

Background Extemporaneous compounding for dermatological use is an important therapeutic alternative for patients whose clinical needs are not met by approved drug products circulated in the market. Evaluating patients' perceptions and levels of satisfaction towards such services is an important factor for the adherence of patients and maintaining the quality of healthcare services. The current study aimed to assess patients' perception and level of satisfaction with the compounding service and extemporaneous preparations rendered at ALERT hospital.

Methods An institution-based cross-sectional study was conducted among patients receiving compounding pharmacy services at ALERT hospital, Addis Ababa, Ethiopia from 10th April to 10th May 2023. A consecutive sampling technique was used to recruit the study participants. Data were collected using an interviewer-administered structured questionnaire, entered into the EPI info, exported and analyzed using SPSS. Multivariate linear regression analysis was performed to determine possible predictors of patient satisfaction and p-value < 0.05 considered as statistically significant.

Results A total of 422 patients recruited and most were predominantly females (64.4%) and aged between 26 and 35 years (38.4%). Nearly 2/3rd had a previous history of compounded medicine use. Majority of the respondents strongly agreed with their satisfaction with price (51.4%), the adequacy of information provided (67.8%), the ease and smoothness of communication with staff (72.0%), and the politeness and supportiveness of staff (73.2%). However, 39.1% of participants disagreed towards the fairness of compounding service waiting time. The overall positive perception and satisfaction level of patients at ALERT hospital receiving the compounding service for their dermatological preparations were 84.41% and 78.57%, respectively.

Conclusions The patients' perception and satisfaction towards the compounding service at ALERT hospital indicated that the dermatological preparations and the services are optimal. Hence, health professionals and the hospital management should take further steps to improve service quality and enhance patient satisfaction.

Keywords Compounding, Medicine, Dermatological, Perception, Satisfaction, ALERT hospital

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Introduction

Compounding has a long history in the field of pharmacy, serving as the primary form of practice until the advent of the commercial pharmaceutical industry in the mid-twentieth century [1]. Extemporaneous compounding refers to the preparation, mixing, packaging or labeling of a drug as the result of a practitioner's prescription drug to meet an individual patient's needs [2].

Compounded drugs represent therapeutic alternatives for people whose clinical needs are not met by approved drug products circulated on the market. Custom formulations can be compounded to create alternate dosage forms or strengths or to omit inactive components included in an approved formulation to which a patient may have an allergy or otherwise cannot tolerate (e.g., lactose or dyes) [1]. Compounded medications can be either sterile or nonsterile preparations that are made using active and inactive ingredients like products that are manufactured and commercialized by pharmaceutical industries. The common nonsterile preparations include capsules, ointments, creams, gels, and suppositories [3].

Drug compounding is currently an integral part of pharmacy practice and is essential to the provision of healthcare [4]. It is practiced in a variety of pharmacy settings, including retail pharmacies and hospital pharmacies [3]. Such extemporaneous preparations are of special importance in the hospital setting considering the particular conditions of hospitalized patients and the specific needs of individualized patients [5]. Dermatological products are among the commonly compounded products in hospital pharmacies. In light of the fast-growing popularity of compounded preparations, the safety, effectiveness, and use of these medications has become a substantial public health concern for various stakeholders, including medical practitioners, patients, and regulatory agencies [6].

Globally, especially in developing countries, compounding is a common pharmacy practice [7]. In Ethiopia, extemporaneous compounding of dermatological products is on the verge of beginning in public hospitals. Expansion of this service is one of the priority areas of pharmacy practice by the government, and the development of compounding guideline and the provision of continuous capacity building training are among the measures taken by the Ministry of Health–Ethiopia [8]. The prevalence of extemporaneous compounding is generally greater for dermatological and pediatric products owing to the limited access to ready-made formulations designed for a particular patient's medical condition [9].

Patients' perceptions of health care services have become an important indicator for measuring the quality of health care. In addition, patient satisfaction is becoming a critical component of performance improvement and clinical effectiveness [10, 11]. Patients, as the best judge, help to accurately assess and provide inputs to the overall service provision in healthcare facilities, which in turn improves quality healthcare delivery through the rectification of system weaknesses [12].

Assessment of the level of patient satisfaction in a routine manner together with other quality assessment methods contributes to the improvement of healthcare services, which ultimately benefits patients [13, 14]. The process by which a dermatological preparation is compounded is subject to interprofessional and inter-pharmacy and/or hospital variations, so a patient may receive a compounded product that has distinct quality profiles depending on who fills the prescription or where it is filled [1].

Patients' adherence to compounded medications can be influenced by drug product characteristics, such as packaging, dosing regimens, container closure systems, and types of dosage forms [15]. Assessing the nonadherence problem of patients to the medication compounding service helps to design strategies that increase patients' awareness and improve the perception and satisfaction of customers through the provision of quality service in the facility [4]. Hence, the current study aimed to assess patients' perceptions and levels of satisfaction with the compounding services provided by ALERT hospital.

Methods

Study setting

This study was conducted at All Africa Leprosy, Tuberculosis and Rehabilitation Training Centre (ALERT), a specialized hospital located in Addis Ababa, the capital city of Ethiopia. ALERT Hospital initially originated as a leprosarium hospital was established in 1934 by the Sudan interior Mission. Since its establishment, much attention has been given by his Majesty King Emperor H/Selassie I, who named it after his daughter Princess Zenebework Memorial Hospital. Owing to an increase in the magnitude of leprosy and its impact in Africa, the idea of establishing a leprosy treatment and training center was conceived by many international donor agencies, and the name Princess Zenebework Memorial Hospital was changed to ALERT on 11th December 1965. The ALERT hospital specializes in Hansen's disease or leprosy management and educates medical students from Addis Ababa University. Additionally, the Armauer Hansen Research Institute (AHRI) is found in ALERT and was initiated in 1970, with a focus on leprosy research. Currently the hospital has dermatology, ophthalmology, and surgery departments; orthopedic workshop, and rehabilitation program. It also houses a pharmacy that provides a compounding service to patients treated inside

and outside of the hospital. The pharmacy department is staffed by a total of 49 pharmacy professionals, and three pharmacists are assigned for the compounding service and one pharmacist for compounding registration and counseling service is assigned per day. On average, 30 patients per day and 180 patients per week receive compounding services at the hospital.

Study design and period

An institution-based cross-sectional study was conducted at ALERT hospital, Addis Ababa. Ethiopia from 10 April to 10 May 2023.

Source and study population

The source population for the study was all patients visiting the pharmacy units of ALERT hospital. The study population included all eligible patients receiving compounding pharmacy service at ALERT hospital during the study period.

Study variables

Satisfaction and perceptions of compounding services and compounded products were the dependent variables, while demographic characteristics such as age, sex, education, and employment status, as well as a history of previous compounded medication use, were the independent variables.

Eligibility criteria

Patients ≥ 18 years of age who were receiving any compounding services for dermatological conditions were included in the study. Patients who were unwilling to participate and had any type of cognitive problem were excluded from the study.

Sample size and sampling technique

The sample size required for the study was determined using single population proportion formula [16] with the assumption of a 50% overall prevalence of satisfied patients towards compounding services since no similar published study has been found, with a 5% margin of error, confidence level of 95% and detection power of 80%. On the basis of the power calculation and sample size needed to demonstrate satisfaction, a total of 422 study participants were recruited for the study by adding a 10% inappropriate response. A consecutive sampling technique was used to recruit the study participants, and all those who agreed were approached for written informed consent until a required sample was obtained.

Data collection and management

An interviewer-administered structured questionnaire (Supplementary file 1) was used to collect data from patients upon leaving the compounding pharmacy unit. The questionnaire includes participants' sociodemographic characteristics (such as age, sex and educational status), compounded products use history (use status and frequency), patients' perception (such as on the compounded medicines safety, effectiveness and quality) and satisfaction (such as on the price of compounded medicines, the service waiting time and the adequacy of professionals for the service and their communication). The questionnaire was initially developed in English by experts in the pharmacy compounding service and as per different published articles [17–19] and then translated to Amharic (local and national language) and back-translated to English to ensure consistency. Data were collected by trained data collectors in Amharic after taking written informed consent, and pilot testing of the questionnaire was performed with 5% of the study participants. Training was given to three data collectors on the contents of the data collection tool and data collection techniques. The collected data were reviewed and checked for completeness and consistency on a daily basis.

Data analysis

The data were entered into EPI info V4.2, exported to and analyzed using the Statistical Package for Social Sciences (SPSS) version 23. The findings reported as per the STROBE checklist for cross-sectional studies reporting format. Descriptive statistics were used to present the general characteristics of the study participants. The respective Likert scale questions were transformed to a 0–100 scale to calculate the overall level of perception and satisfaction as follows:

Raw score (RS): it is the average of the responses to all the Likert scale questions and was computed as $RS = (I_1 + I_2 + I_3 + \ldots + I_n)/n$; where **n** is the number of questions and I_1, I_2, I_3,…I_n represent the individual responses to each question.

Transform the Raw Score to a 0–100 Scale: Once the raw score is calculated, it is transformed to a 0–100 scale using the following formula:

Transformed Score= [(RS−1)/Range] X 100

Where:

RS is the raw score from the previous calculation.

Range is the difference between the maximum possible value and the minimum possible value of the raw score. In this case, the maximum possible value of the raw score is 5 (the Likert scale is from 1 to 5) and the minimum possible value is 1. Therefore, the range is $5 - 1 = 4$.

This formula scales the raw score to a 0–100 scale, where a lower score corresponds to a lower level of perception and satisfaction, and a higher score indicates a higher level of satisfaction and perception. This method ensures that the responses from the Likert scale, regardless of the number of questions, are normalized to a common 0–100 scale for easier comparison and analysis.

Categorical variables were described by frequencies and percentages, and continuous variables were described by means and standard deviations. Subgroup analysis was performed using student unpaired t-test and one-way ANOVA to compare two groups and three or more groups in the analysis of patient satisfaction and perceptions, respectively. Multivariate linear regression analysis was performed to determine possible predictors of outcome variables after doing a univariate analysis to obtain candidate variables for the final model. A *p-value* < 0.05 was considered as a statistically significant.

Results

Demographic characteristics

As presented in Table 1, a total of 422 patients recruited and were predominantly females (64.4%), aged 26—35 years (38.4%), and had a median age of 33 years (IQR: 26—40). Regarding their residence and educational status, the majority were from urban areas (77.7%) and had completed basic education as per international standards of educational classification (34.6%). Most were full-time employees (38.4%), and nearly 1/3rd had an average family monthly income < $US 35.74 (Table 1).

Compounding medicine/s use history

Among the studied participants, 66.6% had a previous history of compounded medicine use and 42.3% received the product and service at the government hospital pharmacies. With respect to the frequency of receiving the ALERT hospital's compounding service or visit, nearly half of them ($n = 202$) received/visited the compounding service/medicines for the first time (Table 2).

Table 1 Sociodemographic characteristics of patients receiving compounding services at ALERT Hospital, Ethiopia, 2023

Variable, $N = 422$	N (%)
Sex	
Female	276 (64.4)
Male	146 (35.6)
Age in years, mean ± SD: 33.91 ± 10.75, Median (Range): 33 (26—40)	
≤ 25	92 (21.8)
26–35	162 (38.4)
36–45	120 (28.4)
> 45	48 (11.4)
Residence	
Urban	328 (77.7)
Rural	94 (22.3)
Highest educational level completed[a]	
Less than basic	38 (9.0)
Basic	146 (34.6)
Intermediate	108 (25.6)
Advanced	130 (30.8)
Employment status	
Unemployed including students and retired	133 (31.5)
Self-employee (Farmer, merchant, consultant, broker)	127 (30.1)
Fulltime employee (private, government, NGO, religious organization)	162 (38.4)
Average family monthly income in US dollar[b]	
< 35.74	115 (27.3)
35.74—89.35	82 (19.4)
> 89.35—178.69	111 (26.3)
> 178.69	114 (27.0)

[a] According to the international standards of education classification, ISCED-11 and ISCED-97

[b] 1 USD = 55.96 Ethiopian birr, classification was made as per the Ethiopian civil service salary range

Table 2 Compounded medicine/s use history at ALERT Hospital, Ethiopia, 2023

Variable, *N* = 422	N (%)
Previous history of compounded medicine/s use history	
No	141 (33.4)
Yes	281 (66.6)
If yes, source of compounding product, *n* = 281	
From the government hospital pharmacy	119 (42.3)
From private community pharmacy	103 (36.7)
From Both	59 (21.0)
Frequency visit of the compounding unit at ALERT hospital	
This is my first time	202 (47.9)
2–3 times	145 (34.4)
4–5 times	60 (14.2)
> 5 times	15 (3.5)

Respondents' perceptions of compounding services

The participants were also asked to rate their perceived level of agreement with the product- and service-related questions. r Relatively higher respondents strongly agreed with the questions related to compounded medication/s meeting the required quality (64.2%), the adequacy of the labeling information (56.6%), the knowledge (47.6%) and skill (49.3%) of professionals providing compounding service, the price (48.1%), and the compounding service role to enhance the acceptability of pharmacy professionals by patients and the general public (51.9%). However, most rated their level of perceived agreement as neutral for effectiveness (35.8%) and safety (35.1%) related issues of compounded medicine/s (Table 3).

Respondents' satisfaction with the compounding service

The respondents who received the compounded medications were asked a series of questions regarding their satisfaction with the preparations. They were asked to rate their satisfaction on a linear numeric scale, with "1" being "strongly disagree" and "5" being "strongly agree. As described in Table 4, the majority rated their level of agreement as strongly agree for their satisfaction with price (51.4%), waiting area (33.2%) and counseling area (30.1%), convenience and comfort, adequacy of information provided (67.8%), adequacy of staff for the compounding service (40.8%), ease and smoothness of communication with the staff (72.0%), politeness and supportiveness of staff (73.2%) and packaging containers (60.2%). However, the majority either disagreed or strongly disagreed towards the fairness of compounding service waiting time (39.1%) (Table 4).

Relationships between overall perception and demographic characteristics

As described in Table 5, the overall perception of patients at ALERT hospital receiving compounding services was 84.41%. Overall, there was no statistically significant difference with respect to demographic characteristics and previous history of compounded medication/s use.

Table 3 Patients perceptions of compounding services at ALERT hospital, 2023

Questions	Response rate, n (%)					Median (IQR)
	1	2	3	4	5	
I believe the compounded medicine/s meet the required quality	4(0.9)	7(1.7)	29(6.9)	111(26.3)	271(64.2)	5(4–5)
I believe the compounded medicine/s are labeled with adequate information	14(3.3)	30(7.1)	27(6.4)	112(26.5)	239(56.6)	5(4–5)
I believe the compounded medicine/s have better effectiveness than ready to use formulations	3(0.7)	8(1.9)	151(35.8)	113(26.8)	147(34.8)	4(3–5)
I believe the compounded medicines have better safety than ready to use formulations	3(0.7)	9(2.1)	148(35.1)	117(27.7)	145(34.4)	4(3–5)
I believe the professional providing the compounding service have sufficient knowledge on the compounding of medications	1(0.2)	6(1.4)	93(22.0)	121(28.7)	201(47.6)	4(4–5)
I believe the professional providing the compounding service have sufficient skill on the compounding of medications	2(0.5)	6(1.4)	87(20.6)	119(28.2)	208(49.3)	4(4–5)
I believe compounded medicine/s have low price than ready to use formulations	13(3.1)	14(3.3)	90(21.3)	102(24.2)	203(48.1)	4(3–5)
I believe the compounding service enhances the acceptability of pharmacy professionals by the patients and the general public	2(0.5)	5(1.2)	108(25.6)	88(20.9)	219(51.9)	5(3–5)

1 = Strongly disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly agree

Table 4 Patients satisfaction with compounding services at ALERT hospital, 2023

Questions	Response rate, n (%)					Median (IQR)
	1	2	3	4	5	
Perceived satisfaction towards the price of compounded medication/s	36(8.5)	33(7.8)	29(6.9)	107(25.4)	217(51.4)	5(4–5)
The compounding pharmacy waiting area is comfortable and convenient	46(10.9)	110(26.1)	76(18)	50(11.8)	140(33.2)	3(3–5)
Compounding service waiting time is fair	48(11.4)	117(27.7)	94(22.3)	49(11.6)	114(27.0)	3(2–5)
The counseling area for the compounding service is comfortable and convenient	48(11.4)	88(20.9)	82(19.4)	77(18.2)	127(30.1)	3(2–5)
Received adequate information and satisfied with the counseling	12(2.8)	16(3.8)	19(4.5)	89(21.1)	286(67.8)	5(4–5)
Staff numbers are adequate to the compounding service	13(3.1)	48(11.4)	128(30.3)	61(14.5)	172(40.8)	4(3–5)
Communication with the staff providing the compounding service was easy to understand and smooth	13(3.1)	43(10.2)	15(3.6)	47(11.1)	304(72.0)	5(4–5)
Professionals providing the compounding service are polite and supportive	4(0.9)	7(1.7)	22(5.2)	80(19.0)	309(73.2)	5(4–5)
Compounded medication/s I received were well packaged	9(2.1)	21(5.0)	27(6.4)	111(26.3)	254(60.2)	5(4–5)

1 = Strongly disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly agree

Table 5 Comparative statistical analysis of overall perception of compounding services among patients at ALERT hospital according to the categorical sociodemographic and compounded medication/s use history

Variable		Perception level out of 100%, Mean ± SD	*p*-value
Sex	Male	83.97 ± 11.69	0.290
	Female	85.23 ± 11.55	
Age category	≤ 25	84.51 ± 11.19	0.113
	26–35	82.97 ± 12.76	
	36–45	86.39 ± 10.24	
	> 45	84.14 ± 11.50	
Residence	Rural	84.52 ± 11.68	0.700
	Urban	84.00 ± 11.58	
Educational status	Less than basic	83.62 ± 12.10	0.591
	Basic	83.55 ± 11.59	
	Intermediate	84.70 ± 11.10	
	Advanced	85.37 ± 12.05	
Employment status	Unemployed	83.83 ± 11.30	0.623
	Self employed	85.21 ± 10.30	
	Fulltime employee	84.26 ± 12.88	
Average family monthly income in US $	< 35.74	83.73 ± 11.46	0.525
	35.74- 89.35	83.24 ± 10.77	
	89.36–178.69	85.29 ± 10.77	
	> 178.69	85.07 ± 13.52	
Compounding medication/s use history	**No**	83.57 ± 11.95	0.293
	Yes	84.83 ± 11.49	
Overall perception		**84.41 ± 11.64**	

Factors associated with satisfaction with compounding services

Among the seven variables included in the final multivariate linear regression analysis, only three variables, namely, educational, employment and previous medication use history status, were significantly

associated with the overall patient satisfaction with compounding medication/s and services at ALERT hospital as per the enter method of multivariate linear regression and cross validated by hierarchical regression method. About 86.7% (adjusted R square = 0.867, *P < 0.0001*) of the variance in the model was explained by the above six variables. Of these, previous compounded medication/s use and service history accounted for 68.3% of the variance (adjusted R square = 0.683, *P < 0.0001*).

For the current final model, all the independent variables had a variance inflation factor (VIF) value < 10, and the tolerance (1 divided by the VIF) for all the independent variables ranged from 0.234–0.947. Since all tolerance values were above 0.2 and the average VIF was very close to 1, multicollinearity problems did not exist in the models.

The multiple linear equation became; predicted overall patient satisfaction score = 76.65 + 0.018 (being female) + 0.068 (age in years) + −0.004 (being living in urban areas) + −0.077 (basic educational status) + 0.021 (intermediate educational status) + 4.039 (advanced educational status) + −0.029 (monthly income between 35.74 and 89.35 US$) + −0.028 (monthly income between 89.36 and 178.69 US$) + −0.101 (monthly income > 178.69 US$) + −0.174 (previous history of compounded medication/s use and the service). Making other predicator variables in the equation constant, the value indicated that as the number of patients with advanced educational status increased by one, the overall satisfaction of patients receiving compounding services/medications at ALERT increased by 4.039 units (*p = 0.007*). However, as the number of unemployed individuals and patients with a previous history of compounded medication/s or service increased by one, overall satisfaction decreased by 30.17% (*p = 0.044*) and 17.4% (*p < 0.0001*), respectively (Table 6).

Discussion

Extemporaneous compounding services pertain to the process of preparing drugs that are specifically tailored to meet the needs of particular patients [20]. The findings of the study could provide insights into how patients perceive the quality, safety, and effectiveness of the compounded medications they receive. This feedback from patients could help identify areas for improvement in the compounding service.

Approximately two-thirds of the study participants (66.6%) indicated prior use of compounded medications.

Table 6 Factors associated with patients' satisfaction with compounding services

Variable		Satisfaction level out of 100% Mean ± SD	Coefficient (95%CI)	S.E	*p*-value
Sex	Male	78.71 ± 13.58	1.00		
	Female	78.49 ± 14.64	0.018(−2.36, 3.43)	1.473	*0.717*
Age in years			0.068(−0.051, 0.231)	0.072	*0.210*
Residence	Urban	78.81 ± 14.25	1.00		
	Rural	77.73 ± 14.56	−0.004(−3.647, 3.403)	1.793	*0.946*
Educational status					
	Less than basic	75.15 ± 15.92	1.00		
	Basic	77.05 ± 13.24	−0.077(−5.177, 0.555)	1.458	*0.114*
	Intermediate	78.45 ± 14.68	0.021(−3.213, 4.592)	1.985	*0.729*
	Advanced	81.36 ± 14.22	4.039 (1.103, 6.975)	1.494	***0.007***
Employment status					
	Unemployed	76.50 ± 14.43	−3.017 (−5.946, −0.088)	1.490	***0.044***
	Self employed	80.84 ± 13.93	0.137(−1.315, 9.844)	2.838	*0.134*
	Fulltime employee	78.48 ± 14.22	1.00		
Average family monthly income in US $					
	< 35.74	77.02 ± 14.41	1.00		
	35.74- 89.35	77.75 ± 13.55	−0.029(−6.178, 4.071)	2.607	*0.686*
	89.36–178.69	80.46 ± 12.75	−0.028(−6.932, 5.107)	3.062	*0.766*
	> 178.69	78.87 ± 15.89	−0.101(−9.406, 2.934)	3.138	*0.303*
Compounding medication/s use history	**No**	82.06 ± 13.59			
	Yes	76.81 ± 14.31	−0.174(−8.108, −2.339)	1.452	***< 0.0001***
Overall satisfaction		**78.57 ± 14.27**			

This result is comparable with research conducted in Romania (64.5%) [21], but a greater response was observed compared with a study conducted in the United States [22]. With respect to individuals who previously used compounded medications ($n=281$), most (42.3%) received their compounded items from government hospital pharmacies. This might indicate the accessibility and dependability of compounding services inside government healthcare facilities, and it also implies a high level of faith in the healthcare system. All research participants obtained their compounded preparations from community pharmacies, according to a Romanian study [21]. The nature of the research environment and the client's confidence in government pharmaceutical services may be the causes of this disparity. About one-third (36.7%) of the respondents said that they obtained their compounded medications from private community pharmacies, demonstrating the significant role these businesses play in the industry. However, in another study, a significant portion of people used private community pharmacies for compounded pharmaceuticals, highlighting the significance of accessibility, convenience, and potentially individualized services in this industry [6].

Nearly half of the current study participants (47%) reported their first-time use of the compounding service at ALERT hospital. This can be expected, as the hospital is the last referral hospital in the country regarding the dermatology clinical service and is visited by patients coming from all over the country. Additionally, patients could have benefited from the compounded medications and achieved therapeutic outcomes that avoided revisits. On the other hand, this finding may suggest that some patients who received the compounding service before in the hospital turned their face to outside pharmacies to obtain the service because of their dissatisfaction with the service they received from the hospital in their previous visit. Fewer respondents (3.5%) had visited the compounding service unit more than five times, which might be due to the nature of their dermatological cases, which required long-term therapy or medication changes.

More than half of the respondents (52.1%) had visited, at least twice, the hospital's compounding unit to receive their personalized treatments for their skin conditions. Frequently visiting respondents might have a greater chance of expressing their level of satisfaction with the compounding service and could have a stronger perception of the service than those who were new to the service at the hospital.

Compounding services enhance patient–pharmacist relationships, leading to greater perceived quality of care and pharmacist professional satisfaction [23]. On the other hand, quality is usually a concern with respect to the final compounded medications [24, 25], as the compounding practices and extemporaneous preparations do not follow strict regulatory control and approval processes unlike to the ready-to-use preparations manufactured in pharmaceutical industries. Regarding the level of participants' agreement with their perceptions of the compounding services and final preparations, the findings of the current study showed that the majority of the respondents strongly believed that the products met the quality standards (64.2%) and were labeled with adequate information (56.6%). This level of agreement has its own positive impact on the adherence of patients to the prescribed extemporaneously prepared medications. The fear of nonadherence to the compounded medications might not be real, as the study respondents did not show a lower level of agreement on the effectiveness and safety of the compounded medications compared with the marketed ready-to-use medicines. Compared with the marketed products, 35.8% and 35.1% of the respondents had neutral levels of perceived agreement on the effectiveness and safety of the compounded preparations, respectively. With respect to the pharmacy professionals preparing the extemporaneous medicines, the respondents' perceptions showed that approximately half strongly agreed with the professionals' knowledge (47.6%) and skills (49.3%). This level of agreement is crucial for ensuring smooth communication between patients and pharmacists, as patients build their trust in healthcare providers.

Nearly half (48.1%) of the respondents strongly agreed that "compounded medicines have a lower price than ready-to-use formulations". Only 6.4% somewhat disagreed or strongly disagreed with the statement and believed that extemporaneous preparations are more costly than their marketed counterparts are. Unaffordable medicine prices have become one of the most pressing concerns for patients in many low- and middle-income countries [26, 27]. High medicine price is a barrier to accessing treatments, as the majority of patients in Ethiopia still receive medicines through out-of-pocket payments.

Patients' perceptions on their medications play an important role in the overall therapeutic outcome. The overall perception of the study participants with the compounding service and medications was 84.41%. This result highlights positive perception of patients towards the compounding of medications and the overall service, which favors both patients and healthcare facilities. In addition, there was no statistically significant difference between perceptions and sociodemographic characteristics.

The findings of the present study on patients' satisfaction levels revealed that more than three-fourths (76.8%) of the respondents were either satisfied or strongly satisfied with the price of compounded medications. This was

also in agreement with their perception, as the majority (72.3%) either agreed or strongly agreed that the price of such medications was less costly than that of ready-made formulations. Assuring the quality of the provided services is essential for fulfilling patients' expectations and needs [28], and patient satisfaction is a vital metric for assessing healthcare quality and delivering patient-centered care [29, 30]. This satisfaction evaluation helps bridge the gap between the pharmacy services that patients receive and what they truly need [20].

Although the majority of the study participants strongly agreed with the comfortability and convenience of the waiting area (33.2%) and counseling area (30.1%) of the compounding pharmacy, a significant number of respondents disagreed with the fairness of the compounding service waiting time (39.1%). A previous study revealed that effective communication and timeliness are crucial facets shaping patient satisfaction, with waiting times for prescriptions and clear medication information being key determinants [31]. The study results indicated that patients spent a long time in the hospital pharmacy before receiving the compounded medications, which ultimately created dissatisfaction with the service. On the other hand, the majority of respondents (40.8%) strongly agreed with the satisfaction statement that 'staff numbers are adequate for the compounding service'. These findings indicate that the long waiting time of patients might be due to the need for extended time for each patient's medication preparation and counseling services, which require attention to revise the service. The waiting time can be reduced and made reasonable by adopting efficient medication preparation and counseling techniques.

With respect to the pharmacy professionals delivering the compounding service in the hospital, nearly three-fourths of the study patients strongly agreed with their satisfaction statements on smooth communication and its ease (72.0%) and the supportive and polite behavior of the professionals (73.2%). This level of satisfaction is imperative for patients to take their medications appropriately and benefit from their outcomes. Likewise, looking at such satisfied patients makes the pharmacy professionals happy by the compounding practice they are engaged with and increasing their confidence.

The packaging containers used to fill medicines and their labeling have roles in improving patients' compliance to drug therapy [32]. Hence, the design of packaging should be given appropriate emphasis because it enables easy handling and dispensing of medications and provides protection against contamination. With respect to the packaging container for the compounded preparations, most of the study participants (60.2%) strongly agreed that the medicines they received were well packaged. This result is in agreement with another patient satisfaction study conducted in Asir, Saudi Arabia, where the majority (59.1%) responded that their medications were properly packaged [19]. This level of patient satisfaction with packaging is crucial for therapeutic success [19].

Educational level, employment status and previous compounded medication use history were significantly associated with level of satisfaction. The overall satisfaction of patients receiving compounding services/medications at ALERT hospital was significantly better among patients with advanced educational status. In line with this study, a study conducted in public hospitals in Eastern Ethiopia revealed a statistically significant difference in educational status and satisfaction, where those with advanced educational status had better satisfaction levels [33]. However, unemployed patients and patients with a previous history of compounded medication/s or services had significantly lower levels of satisfaction than their counterparts did. In fact, employment status is highly correlated with income status, where employed participants may have greater financial freedom to cover the cost of compounded products [34]. The reason why patients with a history of compounded medication use had a lower satisfaction rate may be because of their initial perceived cure and recurrence of their disease condition. It is believed that dermatological conditions are not serious, particularly in the Ethiopian context, and if there is a need for more healthcare professionals, dissatisfaction and depression may be major concerns [35–37].

Strengths and limitations of the study

Since the current study is the first in its kind, it can serve as a valuable guide for studying the perceptions and levels of patient satisfaction with the drug compounding service given in the country, and it can also help hospitals take appropriate actions to improve service quality and meet patients' needs. Despite this, the study has some limitations. The current study did not consider the method of payment (health insurance funds or out of pocket) of patients for filling their prescription, which may affect their response to the affordability of the compounded preparations. Also, the findings of this study cannot be extrapolated to other hospitals that deliver compounding services, as the study was conducted in a single facility. Moreover, the findings cannot represent the overall satisfaction of patients with the pharmacy service at ALERT hospital, as the study was limited to the compounding service and its preparations.

Conclusion

The overall patient perception and satisfaction towards the compounding service given at ALERT hospital was found to be optimal. Nearly half of the respondents felt

that pharmacy professionals who deliver compounding services had adequate knowledge and skills; and were satisfied with staff communication, politeness and support. However, most disagreed with the fairness of compounding service waiting time. Employment status, educational level and previous history of compounded product use were significantly associated with their level of satisfaction.

Incorporating the identified gaps such as compounding service waiting time, having a continuing capacity building training programs into hospital policies and programs will help maintain and expand knowledge and skills of professionals, optimize the compounding service at ALERT hospital and beyond, enhance both patient satisfaction and the overall quality of care. In addition, health professionals and the hospital management should take further steps to improve service quality and enhance patient satisfaction. In addition, an in-depth analysis of the perspectives of pharmacists and physicians regarding compounding practices should be further considered to obtain a complete picture of compounding practices by health professionals. Moreover, the pharmacist–patient interaction assessment of the compounding and the overall pharmacy service provision at ALERT hospital should be performed periodically.

Supplementary Information

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Supplementary Material 1.

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Authors' contributions
All authors made substantial contributions to the overall conduct of the research. Data gathering: BH, MW. Methodology: MNS, AMF, MW, SA. Analysis: MNS, AMF. Writing original draft: BH, MNS, AMF, AMT. Writing review and editing: SA, MNS, AMF, MW.

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Data availability
The study data are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from the Ethical Review Board of the School of Pharmacy, Addis Ababa University (protocol number: ERB/SOP/519/15/2023). In addition, permission was obtained from ALERT hospital management. Written informed consent was obtained from study participants prior to starting data collection, and the confidentiality of the information was assured. No personal identifiers were used during data collection, analysis or write-up, and the data were analyzed in aggregates. The current study was conducted in accordance with the Helsinki Declaration.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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