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Service Quality and user Satisfaction in the Dispensing of Pharmaceutical Products in Times of COVID-19

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Abstract

Objective: In times of COVID-19, the relationship between the quality of pharmaceutical services and user satisfaction in health facilities has become one of the elements of the most observed global health crisis. The objective of this research was to determine the relationship between the quality of the pharmaceutical product dispensing service with user satisfaction in COVID-19 times.

Method: A sample of 134 users was considered, who applied for questionnaires on the quality and satisfaction of the user with the service received. An ordinal logistic regression model was fitted on data that relate service quality to user satisfaction, reliability, responsibility, safety, empathy and tangibility.

Results: It was found that in times of COVID-19, the quality of the pharmaceutical product dispensing service was valued from low to medium, and the satisfaction, reliability, responsibility, security, empathy and the tangibility of the user with the service received was rated as dissatisfied not very satisfied. The validity of the ordinal logistic regression model for the quality of the dispensing service of pharmaceutical products based on tangibility was evidenced, which confirmed the relationship between the quality of the dispensing service of pharmaceutical products in times of COVID-19 and the tangibility.

Conclusions: The quality of the pharmaceutical product dispensing service was rated from low to medium, which implied a high risk of negative evaluation of the pharmaceutical product dispensing service.

Keywords: access, and evaluation, hospital pharmaceutical services, COVID-19.

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INTRODUCTION

During COVID-19, waiting times, the user's comfort status, interpersonal relationships, user treatment, responsibility in dispensing medicines, service safety and tangibility, which were previously considered "normal", They became elements that qualified the inefficiencies or inabilities of the institutions, especially to facilitate the flow of pharmaceutical care, making them perceived as inefficient, ineffective and not very effective, and it is estimated that a significant deterioration of the quality of pharmaceutical service delivery [1]. (WHO, 2020).

In Peru, the line of behavior of pharmaceutical drug dispensing services undergoes changes and adaptations, many of them necessary and others incomprehensible, since they involve the existing operations system or the new design of the provision of product dispensing services pharmacists. Many of the processes of the provision of these services simplified the assembly, but the digital circuit conductors are not working in the same logic, causing the internal communication codes not to produce the effect for the adequate attention of the internal and external users [2]. (Adarsh et al., 2020).

The importance of studying the relationship between the quality of the dispensing service of pharmaceutical products with user satisfaction in COVID-19 times, is in the need of the institutions that provide health services to improve and / or permanently modify their systems of operations. In this context, the objective of this research is to study the relationship between the quality of the pharmaceutical product dispensing service with the reliability, responsiveness or responsibility, security, empathy, and tangibility inherent in user satisfaction in times COVID-19, in a Hospital in Peru, 2020.

MATERIALS AND METHODS

The sample consisted of 134 users of the dispensing service of pharmaceutical products of a hospital in Peru in times of COVID-19, 2020. Questionnaires of perception of the quality of the service and satisfaction were applied in order to identify the service quality indicators (Table 1) and user satisfaction (Table 2).

Table 1. Indicators for quality of service in the dispensing of pharmaceutical products in COVID-19 times.

Variables	Dimension	Indicators	Measurement level
Calidad del servicio	Percepción general de la calidad del servicio	Procedure. Payment to be attended. Wait time. Opinion on the waiting time. Opinion on the solution to the need for	Deficiente Regular Buena

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		health. Opinion on the responses of the Institution's staff to your concerns. Opinion on the cleaning of the Institution. Opinion on the physical plant of the hospital. Opinion on waiting rooms, chairs, beds and stretchers. Treatment received from healthcare personnel. Treatment received from administrative staff. Cooperation between Hospital officials. Professional capacity. Guidance received for your health care at home. Qualification of the quality of the service received, from zero to five being zero lousy and five excellent. General opinion about the care received. Would go back to the hospital

Table 2. Indicators for user satisfaction in the dispensing of pharmaceutical products in COVID-19 times.

Variables	Dimension	Indicators	Measurement level
User satisfaction	Reliability	Degree of difference between P-E on reliability of services.	P-E: Dissatisfied 0 a (-35) Not at all satisfied 1 a 14 Satisfied 15-35
	Responsability	Degree of difference between P-E on liability.	P-E: Dissatisfied 0 a (-28) Not at all satisfied 1 a 11 Satisfied 12- 28
	Security	Degree of difference between P-E of safety in the dispensing of PF.	P-E: Dissatisfied 0 a (-28) Not at all satisfied 1 a 11 Satisfied 12-28
	Empathy	Degree of difference between P-E to empathy in FP dispensing services.	P-E: Dissatisfied 0 a (-35) Not at all satisfied 1 a 14 Satisfied 15-35
	Tangibility	Degree of	P-E:

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	difference between P-E relative to the tangibility of FP dispensing services.	Dissatisfied 0 a (-28) Not at all satisfied 1 a 11 Satisfied12-28

Ordinal logistic regression

When the categories of the response variable have a natural order, ordinal logistic regression will be the one chosen as the most optimal way to study these data. The most relevant aspects of ordinal logistic regression are described below (for details see: [3, 4, 5]). Harrell (2001), Kleinbaum et al. (2002) and Kleinbaum and Klein (2010).

Proportional Odds Model

Also known as the Accumulated Logit Model. Generally, if an ordinal response variable D has G categories (D = 0, 1, 2,..., $G-1$), then there are G - 1 ways to dichotomize the response: ($D \geq 1$ ´or $D < 1$; $D \geq 2$ ´or $D < 2$,..., $D \geq G-1$ ´or $D < G-1$). For a random event S, its "odds" or "advantage" is defined as the ratio between the probability of occurrence and the probability of non-occurrence. With the categorization of D, you can define the "odds" or "advantage" that $D \geq g$ divided by the probability that $D < g$.

$$odds(D \geq g) = \frac{\mathbf{P}(D \geq g)}{\mathbf{P}(D < g)} \text{ where } g = 1,2,3,\dots,G-1$$

The proportional odds model makes an important assumption. Under this model, the odds ratio that evaluates the effect of an explanatory variable for any of the previous divisions or categorizations will be the same regardless of where the cut-off point is made on the categories.

The form of the proportional odds model is now presented with a response D of G levels (D = 0, 1, 2 ,..., $G-1$) and an explanatory variable X_1. The model expresses the probability that the response variable is in a category equal to or greater than g as a function of the explanatory variable X_1 as follows:

$$P\left(D \geq g / X_1\right) = \frac{1}{1 + exp\left[-\left(\alpha_g + \beta_1 X_1\right)\right]}, \qquad g = 1,2,\dots,G-1$$

Therefore, the probability that the response variable is in a category lower than g is:

$$P\left(D < g / X_1\right) = \frac{exp\left[-\left(\alpha_g + \beta_1 X_1\right)\right]}{1 + exp\left[-\left(\alpha_g + \beta_1 X_1\right)\right]}$$

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The model can be defined equivalently in terms of the odds of an inequality. If we replace the formula $P\left(D \geq g/X_1\right)$ by the expression for the odds then:

$$odds\left(D \geq g/X_1\right) = e^{\alpha_g}.e^{\beta_1 X_1}$$

Extension of the Ordinal Model to k variables

Expanding the model to add more explanatory variables is obtained directly, it is enough to expand the linear predictor. Representing by *X* the random vector of explanatory variables, the model can be expressed by:

$$P\left(D \geq g/X\right) = \frac{1}{1 + exp\left[-\left(\alpha_g + \sum_{i=1}^{k} \beta_i X_j\right)\right]}, \qquad g = 1,2,3, \dots, G-1$$

The odds for the answer greater than or equal to level g would be the following:

$$odds(D \geq g \ / \ X) = exp(\alpha_g + \sum_{i=1}^{k} \beta_i X_j)$$

Probability Function for the Ordinal Model

To formulate the probability function for the proportional odds model, the observed probabilities in the responses for each individual are required. An expression for these probabilities in terms of the parameters that govern the model can be obtained by the following relationship:

P = odds/(odds + 1), or the equivalent expression P = 1/[1 + (1/odds)]

In the proportional odds model, the probability that $D \geq g$ is modeled.

The Probability Function (L). It is calculated by taking the product of individual contributions as follows:

$$L = \prod_{j=1}^{n} \prod_{g=0}^{G-1} P(D = g/X)^{y_{ig}} \qquad y_{ig} = \begin{cases} 1 & \text{if the j} - \text{th subject complies } D = g \\ 0 & \text{otherwise} \end{cases}$$

Parameter estimation

The parameters of the model can be estimated by maximum likelihood, maximizing the likelihood function:

$$L(\alpha, \beta/Y, X) = \cdots = \prod_{i=1}^{n} \prod_{j=2}^{g=1} \left[\frac{1}{1 + e^{-(\alpha_1 + \beta' X_j)}}\right]^{\delta_{j1}} \left[\frac{1}{1 + e^{-(\alpha_j + \beta' X_j)}} - \frac{1}{1 + e^{-(\alpha_{j-a} + \beta' X_j)}}\right]^{\delta_{ij}}$$

where:

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$$\delta_{ij} = \begin{cases} 1 & s\text{if the j} - \text{th subject complies } Y = y_{ij} \\ & 0 \text{ otherwise} \end{cases}$$

Hence for the properties of the MV estimators,

$$\hat{\theta}_{k,MV} \sim N\left(\theta_k, \sqrt{\hat{F}_{kk}^{-1}}\right)$$

Analogously to the Generalized Linear Model, the Wald test can be performed to solve the hypothesis test

$$H_0: \beta_k = 0$$

$$H_1: \beta_k \neq 0$$

with the test statistic

$$\frac{\hat{\beta}_k}{\sqrt{\hat{F}_{kk}^{-1}}} \sim N(0,1), \text{or equivalently } \frac{\hat{\beta}_k}{\hat{F}_{kk}^{-1}} \sim \chi_1^2$$

Library "ordinal"

For modeling, the “ordinal” library [6] (Christensen, 2015) of the R package was used (for details, see Appendix). Its objective is to implement the proportional odds model and other ordinal models.

RESULTS

In Table 3, the quality of the pharmaceutical product dispensing service in times of COVID-19 at the Virú Hospital varies from average (50.7%) to discharge (46.3%), while user satisfaction with the service received is mainly in the range from dissatisfied (3.7%) to not at all satisfied (59.7%). The inherent reliability of user satisfaction with the service received is between dissatisfied (8.2%) and not at all satisfied (56.0%), while the responsibility inherent to user satisfaction varies from dissatisfied / a (8.2%) to not at all satisfied (58.2%), the security linked to user satisfaction with the service received is in a range from dissatisfied (5.2%) to not at all satisfied (54.5%), the empathy associated with user satisfaction with the service received ranges from dissatisfied (9.0%), to not at all satisfied (51.5%) and finally the tangibility inherent to the user satisfaction with the service received varies from dissatisfied (9.0%) to not at all satisfied (54.5%).

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Table 3. Quality of the pharmaceutical product dispensing service in times of COVID-19, at the Virú Hospital, 2020.

Indicator	Ranking levels	QUALITY OF SERVICE			
		Low (%)	Medium (%)	High (%)	Total (%)
Reliability	Dissatisfied	0,0	3,0	0,7	3,7
	Not at all satisfied	3,0	44,8	11,9	59,7
	Satisfied	0,0	3,0	33,6	36,6
Responsability	Dissatisfied	2,2	2,2	3,7	8,2
	Not at all satisfied	0,7	46,3	9,0	56,0
	Satisfied	0,0	2,2	33,6	35,8
Security	Dissatisfied	1,5	4,5	2,2	8,2
	Not at all satisfied	0,7	44,0	13,0	58,2
	Satisfied	0,7	2,2	30,6	33,6
	Dissatisfied	0,0	3,7	1,5	5,2
	Not at all satisfied	2,2	41,8	10,4	54,5
	Satisfied	0,7	5,2	34,3	40,3
Empathy	Dissatisfied	0,7	3,7	4,5	9,0
	Not at all satisfied	2,2	42,5	6,7	51,5
	Satisfied	0,0	4,5	35,1	39,6
Tangibility	Dissatisfied	0,7	3,7	4,5	9,0
	Not at all satisfied	2,2	44,0	8,2	54,5
	Satisfied	0,0	3,0	33,6	36,6

Table 4 shows the ordinal logistic regression analysis on data that relate the quality of the pharmaceutical product dispensing service in times of COVID-19, at the Virú Hospital, 2020 with user satisfaction, reliability, responsibility, safety , empathy and tangibility. Regarding the goodness of fit of the model, the results of parallel lines ($P \leq .05$) indicate that the model with the variables user satisfaction, reliability, responsibility, safety, empathy and tangibility significantly improve the fit, compared to the model that consider only the constant. The Pearson chi-square statistic for the model and another chi-square statistic based on the deviation are shown, which are intended to check if the observed data are incompatible with the adjusted model, hence, the model fits the data adequately ($P> .05$). In Table 4, it is observed that variables such as reliability, responsibility, safety and empathy, have little significance ($P> 0.05$) and, therefore, can be eliminated. Only one covariate; tangibility is significant ($P \leq .05$). This suggests that there may be a relationship between the quality of the pharmaceutical dispensing service and tangibility. It is suggested to consider eliminating the non-significant variables and proposing a reduced model with only tangibility as a predictor of the quality of the pharmaceutical product dispensing service.

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Table 4. Multiple logistic regression model for the quality of the pharmaceutical product dispensing service in times of COVID-19, in the Virú Hospital, 2020 based on user satisfaction, reliability, responsibility, safety, empathy and tangibility.

Covariate	$\hat{\beta}_p$	Standard error	Wald	P value	CI (95%)	
					Lower limit	Upper limit
Constant Satisfaction =0	-1.78388	1,34866	-1,32	0,186		
Constant 2 Satisfaction =1	0,641083	1,25940	0,51	0,611		
Fiability (X_1)	0,0573634	0,093340	0,61	0,539	0,88	1,27
Responsability (X_2)	0,140697	0,149409	0,94	0,346	0,86	1,54
Security (X_3)	0,416161	0,273028	1,52	0,127	0,89	2,59
Emphaty (X_4)	-0,257435	0,226443	-1,14	0,256	0,50	1,20
Tangibility (X_5)	-0,344992	0,165413	-2,09	0,037	0,51	0,98
Parallel lines test	-2Log-likelihood		Chi- squared		df	P value
Intersection only	-20,223				5	0,041
General	8,706		14,456			
Goodness-of-fit test						
Pearson			29,7823		33	0,628
Desviance			32,8081		33	0,477

In Table 5 for the ordinal logistic regression model for the quality of the pharmaceutical product dispensing service in times of COVID-19, at the Virú Hospital, 2020 based on tangibility, the non-rejection (P> .05) of the hypothesis null on parallel lines, indicates that the ordinal logistic regression procedure is viable, since the equality of the slopes (β_p) is not rejected. Goodness-of-fit tests based on Pearson's chi-square statistics and deviations (P> .05) show the validity of the ordinal logistic regression model for the quality of the dispensing service of pharmaceutical products based on tangibility. These results confirm

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the relationship between the quality of the pharmaceutical product dispensing service and tangibility.

Table 5. Multiple logistic regression model for the quality of the pharmaceutical product dispensing service in times of COVID-19, at the Virú Hospital, 2020 based on tangibility.

Covariate	$\hat{\beta}_p$	Standard error	Wald	*P* value	CI (95%)	
					Lower limit	Upper limit
Constant Satisfaction =0	-1.277976	0,850917	-0,33	0,744		
Constant 2 Satisfaction =1	1,71396	0,929229	1,84	0,065		
Tangibility (X_5)	-0,885561	0,049415	-1,79	0,043	0,83	1,01
Parallel lines test	-2Log-likelihood		Chi- squared		df	P value
Hypothesis	-22,19		15,557		1	0,069
General	3,315					
Goodness-of-fit test						
Pearson			11,9993		15	0,679
Deviance			14,6952		15	0,474

Risk estimates, relative risks and ODDS ratios

Satisfaction is coded as follows:

Low= 0, medium= 1 and high = 2.

From the risk equation

$$\hat{P}(\text{User satisfaction} \leq g) = \frac{1}{1 + e^{[-(\delta_g - \beta_1 \text{Tangibility }\ )]}}$$

When using the estimates $\hat{\beta}_p$ from Table 4, or the case Satisfaction ≤ 0, tangibility = 1

$$\hat{P}(\text{User satisfaction} \leq 0) = \frac{1}{1 + e^{[-(-1,277976 + 0,885561)]}} = 0,4031361$$

As well,

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$$\hat{P}(\text{Satisfaction} \leq 1) = \frac{1}{1 + e^{[-(1{,}71396 + 0{,}885561)]}} = 0{,}9308307$$

Luego:

$$\hat{P}(\text{Satisfaction} = 0) = \hat{P}(\text{Satisfaction} \leq 0) = 0{,}4031361$$

$$\hat{P}(\text{Satisfaction} = 1) = \hat{P}(\text{User satisfaction} \leq 1) = 0{,}5276946$$

$$\hat{P}(\text{Satisfacción} = 2) = 1 - \hat{P}(\text{Satisfacción} = 0) - \hat{P}(\text{Satisfacción} = 1) = 0{,}0691693$$

Thus, the probability that a user of the pharmaceutical product dispensing service in times of COVID-19, at Virú Hospital, 2020 based on tangibility, will be satisfied is: low (40.31%), medium (52.76 %) and high (6.91%). The quality of the pharmaceutical product dispensing service can be valued mainly from low to medium, which implies a high risk of negative evaluation of the pharmaceutical product dispensing service.

Table 6. Risk of assessment of the quality of the pharmaceutical product dispensing service in times of COVID-19, at the Virú Hospital, 2020 based on tangibility.

Risk	Low	Medium	High
P(Satisfaction)	0,4031361	0,5276946	0,0691693
%	40,31%	52,76%	6,91%

DISCUSSION

The results show the great variety with which we assign values to service quality and satisfaction with them according to the elements or traits that we can temporarily identify as constitutive and convergent processes in development [7] (Pimienta, 2020). When it comes to the quality of a service, we do not speak of the quality of a physical object, but of human interactions whose characteristics with which it is presented make human perception identify them as subjective representations according to the development or intellectual progress that is had about the problem [8] (Woolf et al, 2020). For example, when user satisfaction responds to a preponderance of service quality at an intermediate level (50.7%), as shown in the results of Table 1, we can also identify user satisfaction at the same level , that is to say, not at all satisfied (59.7%), indeed, the cross ratio between these intermediate levels of both service quality and user satisfaction, which reaches almost 50.0% (44.8%), it allows us to point out that in COVID times, the perception of the relationship between both variables is more intelligent than that shown before COVID-19, whose quality and satisfaction were always considered at high levels between 70.0% and 90.0% as shown can be observed in the studies by [9] García and León (2017) in Mexico, with 75.47%

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satisfaction with the pharmaceutical services at the Hospital del Niño de Tabasco y [10] Cárdenas (2018), in Peru, with 79.9% perception of an adequate quality of service and 73.4% of users are satisfied with the care in the services of drug dispensing pharmacists.

Many authors such as [11, 12, 13] Molina, 2020, Zarra, 2020, Stergachis, 2020, among others, could interpret these results as results of the great diversity that social medical phenomena have to express themselves through human perception and, above all, the capacity of the elements that intervene to configure what is known today as quality of service or user satisfaction. This is an improved and articulated functional response since, apparently, our results would indicate a high probability that the user seeks support through these elements to build their social representations of the quality processes and satisfaction with the dispensing services pharmaceutical products, what makes, as we pointed out, that the results respond, as a social expression, to a natural characteristic of the human essence in the current context [14] (IFF, 2020).

Regarding the significant relationship ($P \leq .05$) between the tangibility inherent in user satisfaction with the quality of the pharmaceutical product dispensing service, the results may be due to the way users are being emotionally influenced during the processes provision of pharmaceutical product dispensing services. These processes would be lacking comfort, warmth or clear forms of information and communication, lording it over wrong value judgments since in the midst of the COVID-19 pandemic, it is easier to disintegrate an institutional image than to make a prejudice disappear [14] (IFF, 2020). The impression that the user only considers infrastructure, implementation, internal communication and comfort as secondary elements, is not true, since subjective elements that do not exist and are not enough to mix times are not always revealed and spaces in a true amalgamation of the context and the rigor of the course of the processes [15] (Fernández, et al 2020).

FINAL CONSIDERATIONS

The quality of the pharmaceutical product dispensing service in times of COVID-19 at the Virú Hospital was rated from low to medium, while the satisfaction, reliability, responsibility, safety, empathy and the tangibility of the user with the service received was ranked mainly in the range of dissatisfied / a little satisfied / a. The urinal logistic regression model with the variables user satisfaction, reliability, responsibility, safety, empathy and tangibility was properly adjusted to the data. The validity of the ordinal logistic regression model for the quality of the dispensing service of pharmaceutical products in times of COVID-19 was evidenced, based on tangibility, which confirms the relationship that exists between the quality of the dispensing service of pharmaceutical products in COVID-19 times and tangibility. Finally, the quality of the pharmaceutical product dispensing service in times of COVID-19, at the Virú Hospital, 2020 could be valued mainly from low to medium, which implies a high risk of negative evaluation of the pharmaceutical product dispensing service.

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Conflict of interests

There are no conflicts of interest.

Contribution to the scientific literature

This article studies the relationship between the quality of the pharmaceutical product dispensing service and user satisfaction in COVID-19 times, in a Hospital in Peru.

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