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Statistical Analysis to Identify Factor Related with Patients Satisfaction on General Service in Assosa General Hospital, Western Ethiopia

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Abstract
Patient satisfaction is the extent to which patients are happy with their healthcare provided from the hospital/health center. It is considered as one of the desired outcomes of health care and it is directly related with utilization of health services. The aim of the study was to identify the factor related with patient satisfaction on general service in Assosa General hospital. To reach the aim, the data have been collected through questionnaire from 735 patients, selected using simple random sample of total 2509 population, in October 1 to November 30, 2021. Frequency distribution Table and pie chart were used for data description; binary logistic regression was used to identify the factors that affect patients satisfaction, using R version 4.1.3. The results of this study showed that 43.27% of patients were satisfied and the remaining 56.73% were not satisfied with the service they have received from the hospital. Patients' satisfaction was associated with age, gender, health care quality of services, waiting time for treatment, fee-for-service, availability of drug, laboratory service, cleanness of hospital, doctor and nurse response. From the result of binary logistic regression it can be concluded that age, health care quality of services, waiting time for treatment, availability of drug, cleanness of hospital, doctor and nurse response has significant effect on the satisfaction of patients.
Keywords: Satisfaction of patients, Binary logistic regression, the odds

Introduction

Patient satisfaction is the extent to which patients are happy with their healthcare provided from the hospital/health center. It is considered as one of the desired outcomes of health care and it is directly related with utilization of health services. However, it is not brought to desired level due to different reasons through out the world. Asking the patients what they think about the care and treatment they received is an important step toward improving the quality of care and to insuring that local health services are meeting patient's needs (Prakash, 2010).

Globally, the patient satisfaction become an emerging health policy all over the world and a key determinant of quality of care (WHO, 2014). Several nations are developing innovations to improve the different aspects of quality. Many low- and middle-income countries have developed successful interventions, but require a global platform to share knowledge. This will allow nations to learn from successful interventions and adapt them to their local populations. It will also allow nations to avoid directing efforts towards unsuccessful

interventions. Improving quality of care has proven challenging for all nations (Al-Abri and Al-Balushi, 2014). However, providing quality care to people everywhere remains the most important shared responsibility and opportunity to improve the health of people globally. With a deliberate emphasis on quality, nations will be able to make significant progress towards achieving the Sustainable Development Goals and attaining universal health coverage. Thus, there is a strong connection between health service quality and patients satisfaction (Busse, 2014).

Studies indicated that the patients found to be dissatisfied with the availability of drug, waiting time and payement status (Kebede et al., 2021), while some others were still dissatisfied with the level of health education, communication and information they received about their illness (Woldeyohanes et al., 2015). Factor like age (Adhikari et al., 2021), doctors' interpersonal skills and waiting time (Chandra, Ward and Mohammadnezhad, 2019), health care quality, laboratory service, cleanness of hospital, doctor and nurse care (Asamrew, Endris and Tadesse, 2020), are significantly affect the satisfaction of patients. In addition to those factors availability of drug has also significant effect on the satisfaction of patients (Asres et al., 2020).

Measuring patients' satisfaction has become an integral part of hospital management strategies for quality assurance and increase process in most countries, describing the patient's view point and evaluating care by reflecting patient views back into the system and through comparing facilities (Aldebasi and Ahmed, 2011; Ambelie, 2014). Ethiopia has been implementing the Health Sector Development Program (HSDP) since 2005. As such, there has been encouraging improvements in the coverage and utilization of the services over the periods of implementation of the HSDP. Even though, the sort of Ethiopia attempted to increase health care service, the satisfaction of patients is still low with the services being provided in the hospital (Girmay, 2006; Asres et al., 2020; Aga, Ferede and Mekonen, 2021). Therefore, the aim of this study was to identify factors affecting patients satisfaction regarding hospital services provided in AGH, Assosa, Ethiopia.

Data and Methodology

Study Area

The study was conducted at Assosa General hospital (AGH). Assosa General hospital is found in Benishangul-Gumuz Regional State, Assosa town; in which the region is one of the nine regional states established in 1994 by the constitution of Ethiopia. Assosa, capital city of the region which has 667 km distance from Addis Ababa. The hospitals gives services to patients with different cases and serves as biggest referral hospital in the region. It start to give service since 1958 E.C.

Study Population

The data for this study was obtained from the patient in AGH, Assosa town, Ethiopia. Patients who have been received care from AGH during October 1 to November 30, 2021 was considered as the target population of the study. The total number of patients who received care were estimated to be 2509 from patients goes to hospital for treatment between October 1 to November 30, 2020 year.

Sampling Design and Techniques

Sampling Techniques

Sampling technique was a method of selecting sample from entire population. For this study simple random sampling was used to select sample from a total population of 2509 patients received general service at AGH. A cross-sectional study which deployed interviewer administered questionnaires has been carried out to assess the patient satisfaction with general services. For pediatric age group patients, adult

care givers who accompanied them were used as respondents.

Sampling Design

The response of the patient satisfaction can be categorized in to two classes: satisfied and not satisfied. To find sample size for this study, the proportion of patient those who were satisfied and not satisfied, as well margin of error should be known. Thus, proportion of patients who are satisfied with hospital services was estimated to be 42% using Pilet Survey, margin of error is 3% and the desired confidence level of 95%. Based this information the sample size determination for this study was as follows:-

$n = \frac{n_0}{1+\frac{n_0}{N}}$ (Cochran, 1977),

where

$$n_0 = \frac{Z^2{}_{\alpha/2}pq}{d^2}$$

$Z_{\alpha/2}$=accuracy level of significance

α=5%, level of significance

d=3%, is the margin of error

p=42%, is a proportion of patient those who are satisfied

q=1-p, is a proportion of patient those who are not satisfied

To select the sample size (n), the following two cases are considered:

Case 1

If $\frac{n_0}{N}$< 5%, then n=no

Case 2

If $\frac{n_0}{N} \geq 5\%$, then $n = \frac{n_0}{1+\frac{n_0}{N}}$

Thus, $n_0 = \frac{(1.96)^2 * 0.42 * 0.58}{(0.03)^2} = 1039.79$, N=2509

and $\frac{n_0}{N} = \frac{576.24}{2509} = 0.4143$ which is > 0.05. Therefore, $n = \frac{1039.79}{1+\frac{1039.79}{2509}} = 734.907 \approx 735$

Data Collection Procedure

Ethical permission has been obtained from the Research Ethics Review Board of Assosa University. Then primary data were taken from patient's in the hospitals by data collectors using structured questionnaire. The data collector in the hospital has been collect the data after they took one day training on the objective and relevance of the study, how to gather the appropriate information, procedures of data collection techniques and the whole contents of the interview. The researcher monitored the overall data collection process during the data collection period.

Variables in the Study

The variable that has been used as dependent for this study was satisfaction of patients having categories: not satisfaction and satisfied(Y=0 not satisfied and Y=1 satisfied).

The covariates/predictors considered in this study were age (<15, 15-50, >50) in year, gender (female, male), marital status (single, married, divorced, widowed), place of residence (urban, rural), health care quality of services (no, yes), waiting time for treatment (<2, 2-5, >5) in hours, fee for service (no, yes), availability of drug (poor, fair, good, very good, excellent), laboratory service (poor, fair, good, very good, excellent), cleanness of hospital (poor, fair, good, very good, excellent), doctor response (poor, fair, good, very good, excellent) and nurse response (poor, fair, good, very good, excellent).

Methods of Statistical Analysis

Descriptive Statistics

The frequency distribution table and pie chart were used to summarize patient satisfaction data obtained from the hospital using structured questionnaire.

Chi-squared Test of Independence

The chi-squared test of independence is one of the most basic and common hypothesis tests in the statistical analysis of categorical data. It will be used to test the association between binary response variable and explanatory variables. In addition it is used to identify which predictor variable are taken in the model and which are not. The predictor variable with p-value greater than 25% are not included in the model (Agresti, 1997).

Binary Logistic Regression Model

Binary logistic regression is used when the dependent variables are either binary (dichotomous) variable. It can be used to predict a dependent variable on the bases of continues or categorical independent variables and rank the relative importance of independent variable, to assess the interaction effect or to understand the impact of covariate(s) (Agresti, 1997). Unlike the discriminate analysis, the logistic regression does not have the requirements of the independent variables to be normally distributed, linearly related, nor equal variance with in each group (Tabachnick and Fidel, 1996).

Parameter Estimation for the Model

The maximum likelihood and non-iterative weighted least squares are the two most computing estimation methods used in fitting logistic regression model. When the assumption of normality of the predictors does not hold, the non- iterative weighted least squares method is less efficient. In contrast, the maximum likelihood estimation (MLE) method is appropriate for estimating the logistic model parameters due to this less restrictive nature of the underlying assumptions (Hosmer and Lemeshow, 1989). Hence, the MLE technique would be applied to estimate parameters of the model.

Model Building

The methods of selecting a subset of covariates in Binary logistic regression are essentially similar to those used in any other regression models. Thus, the model was built using Hosmer and Lemeshow (1998) recommendation.

Model Diagnostics

Assessing goodness of fit involves investigating how close values predicted by the model with that of observed values. The question is to test whether the fitted model fit the data or not. The deviance is used for this purpose (Agresti, 1997).

Results

Descriptive Analysis

The data for this study has been taken from 735 patients treated at AGH, Ethiopia during October 01 to November 30, 2021. As shown in Table 1 below, from the total of 735 patients in the

hospital, 417(56.73%) were not satisfied by service the have been obtained from the hospital and the remaining 318(43.27%) were satisfied. Most of patients in the hospital were female with age category of 15-50 years old. The treated patients in the hospital were mostly from rural area.

Looking the response of patients on the health quality care of service in the hospital, 56.79% were responded as there is no service quality and the remaining 43.30% were responded as there is service quality care in the hospital. Patients in the hospital receive treatments after staying more than 2 hours in most cases.

By considering fee for service in the hospital about 52.90% response of patient were as there as there is no acceptable fee for service they provided and the remaining 47.10% patients respond as there is acceptable fee for service they provided. The majority of respondent respond as there is poor availability of drug, laboratory service and cleanness of hospital. The respondents are also highly respond as there is fair doctor and nurse response while giving treatment in the hospital.

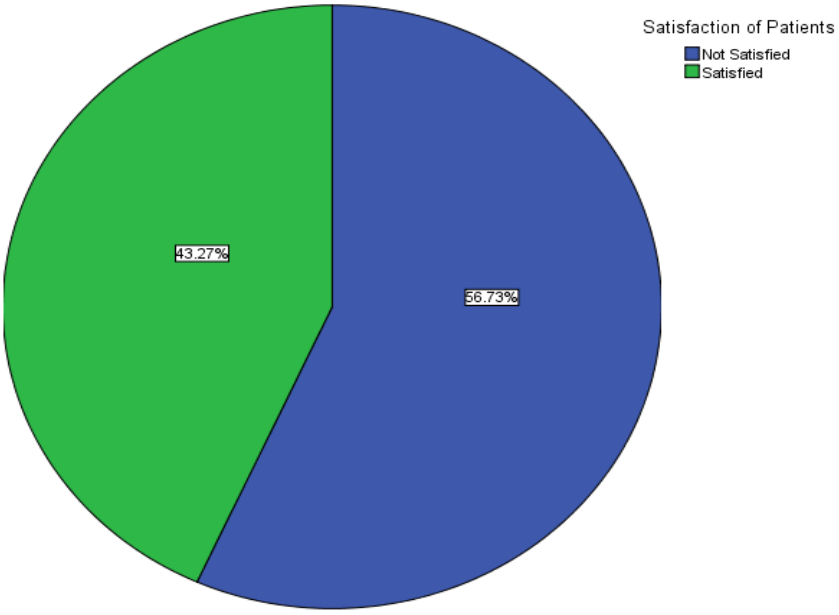

Figure 1: Pie chart that shows patients satisfaction in AGH

Table 1: Descriptive Statistics Summary

Covariates	Categories	Patient Satisfaction		Total (%)
		No(%)	Yes(%)	
Age	<15	64(15.30)	25(7.90)	89(12.10)
	15 - 50	237(56.80)	194(61.00)	431(58.60)
	>50	116(27.80)	99(31.10)	215(29.30)
Gender	Female	248(59.50)	165(51.90)	413(56.20)
	Male	169(40.50)	153(48.10)	322(43.80)
Marital Status	Single	125(30.00)	93(29.20)	218(29.70)
	Married	165(39.60)	120(37.70)	285(38.80)

	Divorced	79(18.90)	68(21.40)	147(20.00)
	Widowed	48(11.50)	37(11.60)	85(11.60)
Place of residence	Urban	181(43.40)	133(41.80)	314(42.70)
	Rural	236(56.60)	185(58.20)	421(57.30)
Health care quality of services	No	257(61.60)	160(50.30)	417(56.70)
	Yes	160(38.40)	158(49.70)	318(43.30)
Waiting time for treatment	<2	123(29.50)	88(27.70)	211(28.70)
	2-5	129(30.90)	135(42.50)	264(35.90)
	>5	165(39.60)	95(29.90)	260(35.40)
Fee for service	No	236(56.60)	153(48.10)	389(52.90)
	Yes	181(43.40)	165(51.90)	346(47.10)
Availability of drug	Poor	154(36.90)	136(42.80)	290(39.50)
	Fair	176(42.20)	102(32.10)	278(37.80)
	Good	49(11.80)	34(10.70)	83(11.30)
	Very good	21(5.00)	27(8.50)	48(6.50)
	Excellent	17(4.10)	19(6.00)	36(4.90)
Laboratory service	Poor	124(29.70)	86(27.00)	210(28.60)
	Fair	100(24.00)	92(28.90)	192(26.10)
	Good	106(25.40)	56(17.60)	162(22.00)
	Very good	70(16.80)	76(23.90)	146(19.90)
	Excellent	17(4.10)	8(2.50)	25(3.40)
Cleanness of hospital	Poor	117(28.10)	85(26.70)	202(27.50)
	Fair	99(23.70)	84(26.40)	183(24.90)
	Good	114(27.30)	56(17.60)	170(23.10)
	Very good	71(17.00)	83(26.10)	154(21.00)
	Excellent	16(3.80)	10(3.10)	26(3.50)
Doctor response	Poor	86(20.60)	55(17.30)	141(19.20)
	Fair	126(30.20)	114(35.80)	240(32.70)
	Good	114(27.30)	71(22.30)	185(25.20)
	Very good	81(19.40)	58(18.20)	139(18.90)
	Excellent	10(2.40)	20(6.30)	30(4.10)
Nurse response	Poor	69(16.50)	63(19.80)	132(18.00)
	Fair	133(31.90)	116(36.50)	249(33.90)
	Good	113(27.10)	65(20.40)	178(24.20)
	Very good	91(21.80)	56(17.60)	147(20.00)
	Excellent	11(2.60)	18(5.70)	29(3.90)

Chi-squared Test of Independence

Table 2: Shows Chi-square Test of Independence

Variables	Chi-square value	Degree of Freedom	P-value
Age	9.5629	2	0.0083
Gender	3.9147	1	0.0479
Marital Status	0.7277	3	0.8667
Place of Residence	0.1254	1	0.7232
Health care quality of service	8.9568	1	0.0028
Waiting time for treatment	11.6650	2	0.0029
Fee for Service	4.8743	1	0.0273
Availability of Drug	11.2570	4	0.0238
Laboratory Service	13.0300	4	0.0111
Cleanness of Hospital	15.3510	4	0.0040
Doctor Response	11.4220	4	0.0222
Nurse Response	11.2700	4	0.0237

Table 2 shows Chi-square test of independence between satisfaction of patients and independent variables under consideration. Based on this Table different possible associated variables age, gender, health care quality of services, waiting time for treatment, fee-for-service, availability of drug, laboratory service, cleanness of hospital, doctor and nurse response has p-value less than α-level of significance(α=0.05). Thus, it can be concluded as there is association between those different possible predictor variables and patient satisfaction at 5% level of significance.

Table 3: Maximum Likelihood Estimate of Model Parameter

Covariates	Categories	Coef	SE	Exp(coef)	P-value
Intercept		-1.132	0.3581	0.3222	0.00156
Age	<15				
	15 - 50	0.7758	0.2703	2.1723	0.00410
	>50	0.7343	0.2887	2.0839	0.01099
Gender	Female				
	Male	-0.7600	0.5359	0.4677	0.15616
Health care quality of services	No				
	Yes	1.2194	0.5378	3.3853	0.02335
Waiting time for treatment	<2				
	2-5	0.4232	0.2154	1.5268	0.04948
	>5	-0.2999	0.2061	0.7409	0.14563
Fee for service	No				
	Yes	0.1709	0.1764	1.1863	0.33287
Availability of drug	Poor				
	Fair	-0.4767	0.1851	0.6208	0.01003
	Good	-0.1547	0.2714	0.8567	0.56868
	Very good	0.5291	0.3429	1.6975	0.12279
	Excellent	0.2893	0.3863	1.3355	0.45388
Laboratory service	Poor				
	Fair	0.4771	0.5069	1.6114	0.34655

	Good	0.5008	0.4344	1.6500	0.24900
	Very good	-0.5517	0.5799	0.5760	0.34142
	Excellent	-1.7016	1.2440	0.1824	0.17138
Cleanness of hospital	Poor				
	Fair	-0.3697	0.5173	0.6909	0.47478
	Good	-0.8490	0.4333	0.4278	0.04008
	Very good	0.9023	0.5774	2.4653	0.11809
	Excellent	1.2512	1.044	3.4946	0.29634
Doctor response	Poor				
	Fair	1.2539	0.4587	3.5039	0.00627
	Good	1.3565	0.6159	3.8827	0.02762
	Very good	1.5199	0.5853	4.5718	0.00941
	Excellent	1.9591	0.8803	7.0930	0.02605
Nurse response	Poor				
	Fair	-1.0765	0.4585	0.3408	0.01889
	Good	-1.6565	0.6270	0.1908	0.00825
	Very good	-1.7035	0.5808	0.1820	0.00336
	Excellent	-1.0734	0.8822	0.3419	0.22370

Table 3 shows estimated parameter of binary logistic regression model that related satisfaction of patients with predictors under consideration. From the Table, the estimated odds for patients age categories of 15-50 and >50 years are 2.1723 [with p-value=0.00410] and 2.0839 [with p-value=0.01099] respectively. The odds of being satisfied for patients age categories of 15-50 and >50 years are almost 2 times higher than age category of below 15 years old by keeping the effect of other factor constant.

The estimated odds of patients who say there is health care quality of service vs patients who say there is no health care quality of service is 3.3853 [with p-value=0.02335]. Thus, the odds of being satisfied is 3.3853 times higher for patients who respond as there is health care quality service as compared with patients who respond as there is no health care quality of service by keeping the effect of other factor consant.

Considering the waiting time of patients in the hospital, the estimated odds of patients waiting time between 2 to 5 hours vs waiting time below 2 hours is 1.5268 [with p-value=0.04948]. Keeping the effect of other factor constant the dds of being satisfied is 1.5268 times higher for patients waiting time between 2 to 5 hours as compared with patients waiting time below 2 hours.

Looking availability of drug in the hospital, the estimated odds of patients who respond there is fair availability of drug vs patients who respond there is poor availability of drug is 0.6208 [with p-value=0.01003]. Thus, the dds of being satisfied is 0.6208 times lower for patients who respond there is fair availability of drug as compared to patients who respond there is poor availability of drug by keeping the effect of other factor constant.

The estimated odds of patients who respond there is good cleanness of hospital vs patients who respond there is poor cleanness of hospital is 0.4278 [with p-value=0.04008]. Keeping the effect of other factor constant the odds of being satisfied is 0.4278 times lower for patients who respond there is good cleanness of hospital as compared with patients who respond there is poor cleanness of hospital.

Finally, observing for doctor and nurse reponce, keeping the effect of other factors constant the odds of being satisfied for patients with each category is higher and lower as compared to the reference category for doctor and nurse response respectivily.

Model Diagnostic

Table 4: Deviance Model Adequacy Checking

Deviance Value	Degree of Freedom	P-value
96.4322	27	0.5362

Table 4 above shows Deviance Test (the test statistic commonly used for assessing the overall fit of the logistic regression model). As shown in this Table we cannot reject the hypothesis of the model fit the data adequately since the p-value is lesser than common alpha level of significance (i.e 0.5362 >0.05). Therefore, the fitted model is adequate to fit patients satisfaction data set in the study.

Discussion

The aim of this study was to identify factors affecting patients satisfaction toward they services provided in AGH, Assosa, Ethiopia. The binary logistic regression model was used in order to do so. Total of 735 patients in the hospital were considered in the analysis in which 56.73% were not satisfied by service the have been obtained from the hospital and the remaining 43.27% were satisfied. Thus, the satisfaction of patient with service provided at AGH was low and this study was consistent with different studies done in Ethiopia (Girmay, 2006; Asres et al., 2020; Aga, Ferede and Mekonen, 2021). The age, gender, health care quality of services, waiting time for treatment, fee-for-service, availability of drug, laboratory service, cleanness of hospital, doctor and nurse response were associated with satisfaction of patients.

From multivariable analysis of binary logistic regression model age, health care quality of services, waiting time for treatment, availability of drug, cleanness of hospital, doctor and nurse response has significant effect on the satisfaction of patients. This study was consistent with different researchers work (Asres et al., 2020; Asamrew, Endris and Tadesse, 2020).

The satisfaction of patient with age categories of 15-50 and above 50 years were more than age category of less than 15 years old. This study was consistent with study by Adhikari et al. (2021). In this study patients responding as there is health care quality of service in the hospital satisfied more than patients responding as there is no health care quality of service as study done by different researchers (Asres et al., 2020; Asamrew, Endris and Tadesse, 2020).

The study done by Kebede et al. (2021) shows that patients were dissatisfied with the waiting time and availability of drug in the hospital; which was agreed with the current study. On the other hand, as study indicated by Asres et al. (2020) and Asamrew, Endris and Tadesse, 2020 patients were dissatisfied with laboratory service, cleanness of hospital, doctor and nurse care. Those studies were consistent with this study.

Conclusion

From multivariable binary logistic regression model it can be concluded that age, health care quality of services, waiting time for treatment, availability of drug, cleanness of hospital, doctor and nurse response has significant effect on the satisfaction of patients.

Abbreviations

AGH: Assosa General Hospital; HSDP: Health Sector Development Program; WHO: World Health Organization; MLE: Maximum Likelihood Estimation

Declarations

Acknowledgment

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Funding

Not applicable

Availability of Data

The data will be given upon request on behalf of the corresponding author

Ethical Consideration

The Research Ethics Review Board of Assosa University would provide an ethical clearance for the study. The data has been collected after written permission was given to AGH and Assosa University Research Directors write an official cooperation letter to the hospital for the permission. The data obtained from the hospital were kept confidentially.

Consent for Publication

Not applicable

Software Used

SPSS version 16 was used for coding and R version 4.1.3 was used for data analysis

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