Customers' satisfaction towards Addis Ababa City's minibus taxi service

Gebeyew Tadesse Deyas [a], Mintesnot Gebeyehu Woldeamanuel [b], Sitotaw Haile Erena [c,*]

[a] *Gebeyew Tadesse Deyas, Department of Urban and Regional Planning, Wollega University, Ethiopia*
[b] *Mintesnot Gebeyehu Woldeamanuel, Department of Urban Studies and Planning, California State University Northridge 18111 Nordhoff Street, Northridge, CA, 91330, USA*
[c] *Sitotaw Haile Erena, Center for Food Security Studies, College of Development Studies, Addis Ababa University, Ethiopia*

ABSTRACT

In Addis Ababa, Shared minibus taxis are contributing significantly more than any other form of public transit to meeting the city's transportation needs. But there were limited research done on taxis in general and customer satisfaction with minibus taxis in particular. Therefore, this study aims to assess the satisfaction of minibus taxi customers through a survey questionnaire distributed and collected at taxi stations. Descriptive analysis was used to measure the satisfaction levels/rates of respondents towards each service quality attribute of the minibus taxis. Then, we compared the means value of satisfaction responses followed by factor/principal component analysis. Once the most important satisfaction variables are identified through the factor analysis, an ordered logit model was used to create a relationship between the selected satisfaction variables and the socio-demographic characteristics of taxi riders. The results of the study showed that minibus taxi overload, safety, and security at stations are attributes in which the respondents show greater dissatisfaction. The result of the ordered logit model revealed that the respondents who showed greater dissatisfaction with the taxi drivers and their assistants' behavior are those who had been stolen at least once on a minibus taxi. Also, riders weigh more on the functionality of the service than their comfort and security. Thus, the service providers, Addis Ababa Road Authority, security personnel, and any relevant body should work together on maximizing the customers' satisfaction in minibus taxis.

1. Introduction

The majority of public transit in most African nations is provided by minibus taxis. They are responsible for more than 70 % of all urban travel and control the majority of the social and economic facets of urban mobility [1]. When local governments in developing countries plan for public transportation, taxis are the least of their consideration, mainly due to the fact that taxis are run by private entities and all what is expected of local government is regulating the system. However, shared and paratransit taxis are the main mode of transportation for many urban residents in developing countries. For example, in Addis Ababa, taxi transportation (shared minibus taxis) covers 79 % of the public transportation modal share [2]. In Addis Ababa, residents are served by four major public transport

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* Corresponding author.
E-mail address: sitotahaile@yahoo.com (S.H. Erena).

modes; namely Light Rail Transit (LRT), minibus taxis, medium buses (Higers) and regular public buses (Anbessa, Sheger and Public Service buses), of which the minibus taxis cover the larger modal share.

In 2017, Addis Ababa's population was estimated by the Ethiopian Central Statistical Agency (CSA) to be 3,435,028. With the population is expected to grow to 4,281,394 in 2027 and 5,131,892 in 2037 [3], the demand for transportation is also expected to increase. In response, the city is investing in public buses and light rail systems to meet the existing gap and forecasted travel demand. Yet, minibus shared taxis are playing a major role in meeting the passenger demand more than any other public transport mode in the city. Especially during peak hours, the supply of the shared taxis does not match the demand, which creates crowded stations and long waiting lines. In general, public transportation in Addis Ababa is characterized by chaotic, unreliable, unsafe, unaffordable, and inefficient service for a fast-expanding city [4].

Minibus taxi in Addis Ababa is a semi-bus service in a network of independent taxi operators serving a complex route all over the city. Because of the shared nature of the minibus taxis, they positioned themselves as the 'public transport' mode. Although the locals call them *taxis*, they serve as public transport having a set origin, destination, and to some extent, fixed-route but not fixed stops in between. Passengers can be picked up and dropped off anywhere along the route and in between the origin and the destination. Minibus taxis have owned by individuals and are often driven by a hired driver. The driver has an assistant (also called *woyalas*) that collects fares and helps passengers get on and off the vehicle. In this sense, in addition to providing mobility, minibus taxis create job opportunities for drivers and their assistants.

Taxi owners are part of the taxi associations and they abide by the rules and regulations of Addis Ababa's Transportation Authority. The system of minibus taxi is operated by drivers that know the city well, and can drive without route maps and timetables but with a sense of coordination and order. From this, one can say that minibus taxis comprise a complex-adaptive system run by self-regulated drivers. The city's effort to create a zoning system and capping the number of passengers is usually met by resistance and non-conformity from drivers. The carrying capacity of a minibus taxi is 12 passengers, but during peak hours, it is common to see a taxi carrying up to 18 people, which is highly overcrowded. Despite the importance of taxis as public transport mode, there is a wide criticism of the service in terms of passenger safety, age of minibus taxis that leads to environmental pollution and accidents, and the question of meeting commuter demand in peak periods [2].

There is no significant research done on customer's satisfaction of minibus taxis in Addis Ababa. However, the customer satisfaction in various modes of public transportation, such as the Addis Ababa Light Rail Transit and city bus has been studied by Refs. [5,6], respectively. Different authors have used varied service attributes to measure the customer satisfaction in taxi services. For instance, to assess consumer satisfaction in traditional taxi services, researchers employed comfort, internal environment, and safety [[7–11]]. Furthermore, study by Ref. [12] identified indicators of customer satisfaction with general public transportation as service availability, fares, safety, and security, waiting and access time, comfort, reliability, overcrowding, cleanliness, and information system. This study covers the wide range of customer satisfaction measures comprising fifteen (15) service quality variables in minibus taxi. This distinguishes this study from the previous related studies.

The purpose of this study is to assess the level of customer satisfaction with the Addis Ababa minibus taxi services through responses
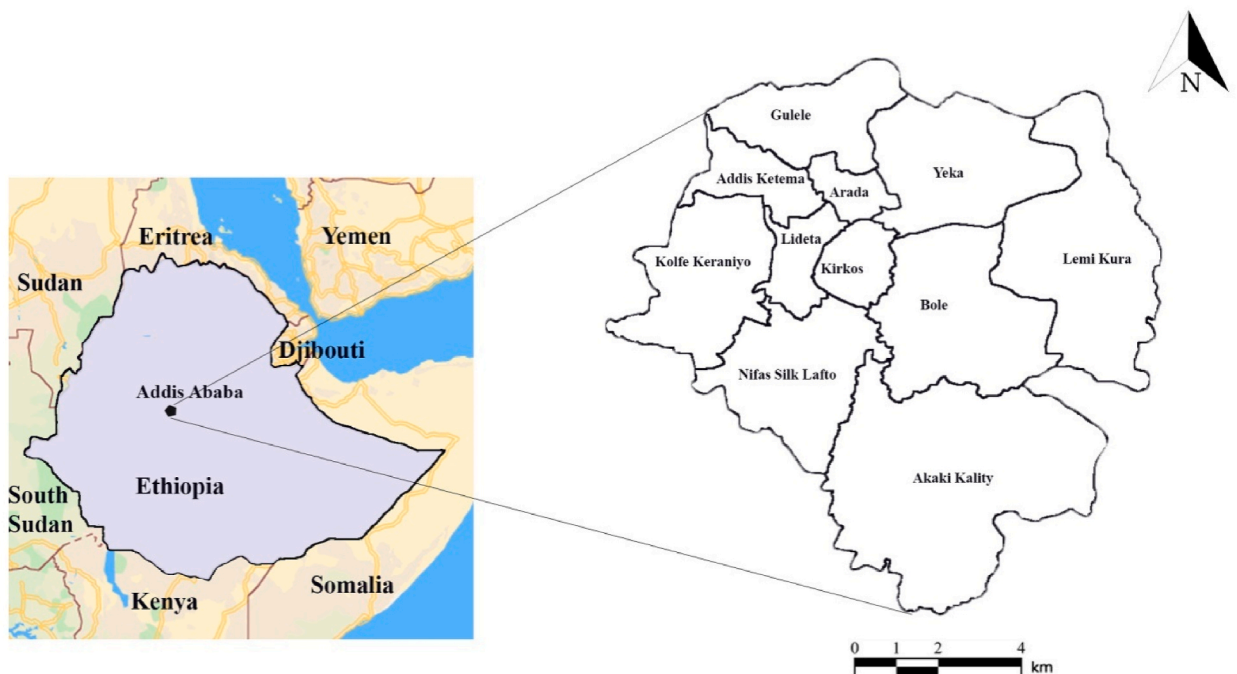

Fig. 1. Location map of the study area.

on a Likert scale. Specifically, this research paper tried to answer to two main research questions. Those are: 1) what are the most important service quality indicators in Addis Ababa minibus taxis for its customers? and 2) what are the services areas that need major improvements? Thus, the result of the study is anticipated to offer a substantial contribution in aiding decision-makers and other pertinent entities engaged in enhancing the Addis Ababa city transportation system.

2. Materials and method

2.1. Location of Addis Ababa

Addis Ababa is a city in Ethiopia's central highlands, having a total area of around 527 km^2 and an average elevation of 2600 m above mean sea level (asl). The elevation ranges from the highest peak at Mount Entoto which is 3041 m to 2051 mean above sea level at the lower part of Akaki plain. Addis Ababa city shares a boundary with surrounding Oromia Special zone towns: Burayuto the West, Sebetato South West, Gelan to the East, LagaTafao to the North, and Sululta to the North East. Fig. 1. Location map of the study area.

Due to the city's horizontal growth and limited access to transportation infrastructures, accessing business activities, education, employment and recreational opportunities is challenging in Addis Ababa.

As the result, there is a significant gap between the supply and demand for public transportation. The existing public transportation is serving more than 8 million people including the people in the town of Oromia Special Zone Surrounding Addis Ababa. In 2017, the city had 3.4 million residents; in 2037, that number is projected to increase to 5,124,480 as forecasted from Ref. [3] using growth rate of 3.8% per year. The city is divided into 11 sub-cities known as *kifle-ketemas* and 120 *woredas*, which are the lowest administrative entities (Fig. 1).

2.2. Sampling technique

2.2.1. Data collection process

In Addis Ababa city, there are various major and minor hub taxi stations. The City Road Authority have already identified four nodal points of transport stations, from which taxi transportation is available to connect various parts of the city and the surrounding Oromia special zone towns as well. Those nodal points are *Piassa*, *Mercato*, *Torhailoch* and *Stadium* stations. Besides, there are various taxi stations progressing to be nodal points. This study took place at eight major hub taxi stations. These stations were purposively selected for being the major hub taxi services providers of the city. Accordingly, four of the nodal taxi stations (*Piassa*, *Mercato*, *Torhailoch* and *Stadium)* and the others four progressing stations *Megenagna*, *Jemmo*, *Bole Bridge* and *Ayertena* taxi stations were purposively selected as sample locations [2]. The location map of the selected minibus taxi stations, where the survey questionnaires were distributed has shown in Fig. 2.
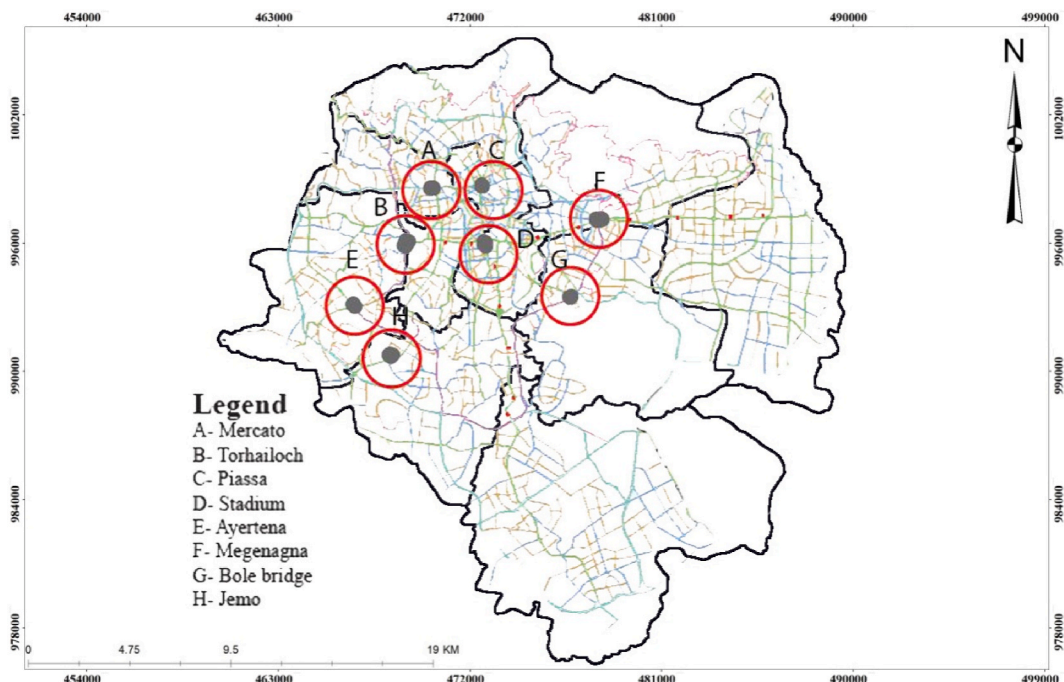

Fig. 2. Minibus taxi stations selected for the data collection.

2.2.2. Questionnaire

400 minibus taxi customers were randomly selected during survey data collection. Because a population size of equal to or more than 100,000 is represented by 385 people or more [13–15]. The simple random sampling technique was used to obtain sufficient information about customers' level of satisfaction towards minibus taxi service. For illiterate customers, a data collector helped them out with the completion of the questionnaire paper. Out of 400 distributed samples, only 351 were filled and responded back (87.75 % response rate).

Service quality attributes of Addis Ababa minibus taxi customers are designed on basis of frequently raised questions by minibus taxi customers, which are also anonymously supported by literatures as well. Accordingly, fifteen different service quality attributes/ components used for this study. Those variables are waiting time, minibus taxi preferability, home to station walking distance, number of transfers, frequency of being stolen at the stations, fare of the minibus taxis, behavior of the taxi drivers and their assistants, security in the minibus taxi and at stations, comfort inside the minibus taxi and at stations, availability of minibus taxis (frequency), the age of minibus taxi and carrying capacity of the taxi. On the questionnaires there are two types of questions due to the nature of the variables i, e. multiple choice questions and Likert scale. Thus, five (5) out of the 15 questions such as waiting time, minibus taxi preferability, home to station walking distance, number of transfers, frequency of being stolen at the stations are collected through multiple choice questions while 10 of them are conducted by a Likert scale type of response. The 10 variables that used likert scale types of responses are fare of the minibus taxis, behavior of the taxi drivers and their assistants, security in the minibus taxi and at stations, comfort inside the minibus taxi and at stations, availability of minibus taxis (frequency), the age of minibus taxi and taxi (over)load. Customers of the minibus taxi were asked to rate their degree of satisfaction with the level of service provided both inside the vehicle and at the stops. The question "How satisfied are you with the following minibus taxi performance and quality indicators?" was followed by a five-point Likert scale response.

2.3. Data analysis

For data analysis, three-step process is administered along with descriptive data analysis. Three steps are focused on Likert scale response designed for 10 variables. The first phase involves comparing the means, median, and mode of consumers' levels of satisfaction with each service quality element. Then, factor/principal component analysis with the Varimax orthogonal rotation method was used in order to find which satisfaction factors are the most important ones. Factors were extracted using the following criteria: an eigenvalue greater than 1 and factor loadings greater than 0.5. A reliability analysis (Cronbach's alpha, α) was used to assess the correlation between variables of each identified factor. All factors with an α reliability above 0.50 were accepted for this study.

Finally, ordered logit model was run to identify the most important socio-demographic variables and variables related to customers experience that influence satisfaction with important service parameters of the minibus taxi identified by the factor analysis. The satisfaction response is inherently ordered (1–5 Likert Scale). Despite the fact that the outcome is discrete, the ordinal character of satisfaction (the dependent variable), makes it impossible for linear multiple regression, multinomial logit, or probit models to take into consideration [16]. Responses on an ordinal scale can be rated or ranked, but the gap between them is not quantifiable. As a result, on a Likert scale, the distinctions between "very satisfied," "satisfied," and "neutral" are not always equal. In other words, one cannot assume that the difference between responses is equidistant even though the numbers assigned to those responses are seems followed sequential order. Therefore, the ordered logit model is help to examine the ordered character of satisfaction responses because it can handle variables with a ranking order. As the result, this study uses the ordinal logit model to examine customer satisfaction with minibus taxis and determine the variables that influence the customers' satisfaction.

3. Literature review

3.1. Factors affecting satisfaction in public transportation

In today's society, transportation plays a vital role in socioeconomic progress. Thus, the level of service provided by transportation mode has an impact on the passengers, either directly or indirectly. People prefer some mode of transportation over another based on the quality of the service provided. To measure customer satisfaction with public transportation, numerous authors from throughout the world have suggested various service quality indicators. According to the study conducted in Lagos, Nigeria, fare, travel time, waiting time, safety and reliability, and fuel consumption are used as factors of customer satisfaction in public transportation [17]. Some researchers mentioned five service qualities namely reliability, tangibility, assurance, responsiveness, and empathy in influencing customer satisfaction in the public transportation [18,19].

Other authors relied on reliability, frequency, affordability and safety to measure the service quality in public transport [20,21]. [22] defined the quality of service in public transportation as the all-encompassing metrics and perceived performance from the perspective of the passengers [23]. also studied customer satisfaction in public transport in Porto and pointed out the dissatisfying factors as an overload (overcrowd), traffic congestion, lack of control, lack of comfort, unreliability, long waiting times, lack of flexibility, time uncertainty, transfer problems, and long walking time. As can be seen from the different authors' points of view, the service quality measurements on customer satisfaction in public transportation are measured in a diverse range. Thus, satisfaction is a relative concept and not a measure of absolute success (or failure) in public transport [24].

3.2. Taxi-specific factors that affect satisfaction

The availability of literature on passengers' views and perspectives towards taxis is not as vast as on the other public transportations. Some studies consider minibus taxis as part of the public transportation system [25]; while other studies categorized minibus taxis as an on-demand pickup service [26].

There are no standardized types of service that affect customer satisfaction in public transport in general and minibus taxis in particular. Hence, various authors have developed different service quality indicators to measure customer satisfaction in taxis (minibus taxis). In Cape Coast, Ghana, comfort, continuous service, reliability, and affordability influenced customer satisfaction in minicab taxi [27]. [28] revealed that timely arrival at destinations, affordability, punctuality, and reliability were the major service quality concerns of minibus passengers in Johannesburg. Furthermore [29], investigated the factors affecting customer satisfaction in the taxi service in India and found out that drivers' behaviors such as professionalism and convenience were identified to be having a significant impact on the overall satisfaction. In addition, the result of a study conducted by the researchers show that, the driver behavior of the taxis was the most important factor of passengers' overall service quality [30]. According to Ref. [31] study on the metered taxi service quality in Bangkok, Thailand, the responsiveness of the taxi drivers had an impact on customer satisfaction.

Moreover, according to a study carried out on the three Taxi companies in Jakarta, there were six service qualities identified to have an effect on customer satisfaction. Those were perceived value, perceived quality, customer expectations, customer trust, company image, and customer complaints [32]. In Malaysia, a study on customer satisfaction on taxi-sharing service discovered that comfort is the most influential factor, among others, on customer satisfaction of ride-sharing services [33]. When we derive a conclusion from the different authors perspective on customers satisfaction in taxi (minibus taxi), we can say that the subjective satisfaction measures don't necessarily confirm with the objective service provision.

4. Results

4.1. Demographic characteristics of respondents

The survey includes demographic information (age, gender, marital status), socio-economic variables (educational status and occupation) and customers' experience with the minibus taxi (number of transfers and waiting time). 68 % of respondents are male

Table 1
Respondents' characteristics and descriptively analyzed levels of satisfaction.

Variable	Count	%	Variable	Count	%
Gender			Number of transfers		
Male	238	68 %	No interchange at all	44	13 %
Female	113	32 %	One-time interchange	58	17 %
Age			Two times interchange	115	33 %
Below 14 years	2	1 %	More than two interchange	134	38 %
15–24 years	112	32 %	Peak-hour waiting time		
25–34 years	141	40 %	None	5	1 %
35–44 years	40	11 %	1–5 min	16	5 %
45–54 years	22	6 %	6–10 min	28	8 %
55–64 years	19	5 %	11–21 min	77	22 %
65 and above years	15	4 %	21–30 min	82	23 %
Educational status			More than 30 min	143	41 %
Illiterate	21	6 %	Off-peak hour waiting time		
Primary school (1–8)	32	9 %	None	15	4 %
Secondary school (9–10)	37	11 %	1–5 min	51	15 %
Preparatory school (11–12)	45	13 %	6–10 min	63	18 %
TVET (vocational training)	24	7 %	11–21 min	104	30 %
Higher Institution, Diploma	61	17 %	21–30 min	52	15 %
Higher Institution, Degree	109	31 %	More than 30 min	66	19 %
Post Graduate (Masters/PhD)	22	6 %	Got stolen while using minibus taxi?		
Marital status			None	212	60 %
Single	155	44 %	Once	69	20 %
Married	187	53 %	Twice	39	11 %
Divorced	4	1 %	More than two times	31	9 %
Widowed	5	1 %	Home to station walking distance		
Occupation			Less than 300 m	64	18 %
Student	100	28 %	301–500 m	93	26 %
Full time	138	39 %	501–700 m	59	17 %
Part time	28	8 %	701–1000 m	39	11 %
Unemployed	35	10 %	1000 and above meters	96	27 %
Housewife	15	4 %	Minibus taxi preferability		
Retired	9	3 %	I don't know	20	6 %
Others	26	7 %	No, it is not preferable	30	9 %
			Sometimes preferable, depending on the time of the day	100	28 %
			Yes, it is preferable	201	57 %

while 32 % are female. This does not reflect the gender composition of the city; however, indicates that more males are responded to the survey questions and use minibus taxis than females. Regarding the age classes of respondents, majority of the respondents are in the age range of 25–34 followed by 15–24 years (Table 1). This shows that most of the respondents are young and middle-aged working class and school-age population of the city. The occupation type of the respondents indicated that 39 % of the respondents, the majority, are full time employees followed by students (28 %). Education level showed that most of the respondents have higher institution degree, diploma and vocational trainings, respectively. Only 6 % are illiterate with no knowledge of writing and reading. The marital status of respondents showed that, 53 % of the respondents are married, followed by singles with 44 %, and 1 % divorce, respectively.

4.2. Factors determining level of satisfaction

Various variables determine the satisfaction level of transport customers. Overall,15 variables were considered to measure the satisfaction level of minibus taxi customers. Five of them were analyzed using descriptive statistics as show under Table 1 while the other ten are analyzed using Likert scale and inferential statistics. The five factors analyzed using descriptive statistics include number of transfers, peak-hour waiting time, off-peak hour waiting time, got stolen while using minibus taxi, and distance between home to station.

As to the distance from home to a taxi station is concerned, 34 % of the respondents reported that they live within 500 m radius from where they catch the taxi. However, a significant percentage of respondents (27 %) replied that they traveled more than a kilometer to access the nearest taxi station. Waiting time is one among many challenges that taxi customers face. During peak hours, the majority of the respondents (41 %) reported that they wait for a taxi for more than 30 min. About 19 % of respondent reported that they are waiting taxi for more than 30 min during off peak hour. One of the issues with using the minibus taxi, especially during peak hour is pick pocketing. Respondents were asked in the survey on how many times they were stolen in a taxi or at the station. Accordingly, 60 % of the respondents answered 'none', however, 31 % said they experienced pick-pocketing once or twice. The rest 9 % reported that they were stolen more than two times. As far as numbers of transfers to reach to their destinations, 71 % of the respondents replied they made two or more than two transfers. This shows that it is hard to get a direct taxi line from an origin to a destination.

4.3. Likert scale results

In addition to the descriptively analyzed factors, 10 factors that determine the satisfaction level of Minibus taxi customers were analyzed based on the Likert scale response. Accordingly, most of the customers (80 %) reported that they are not satisfied with the
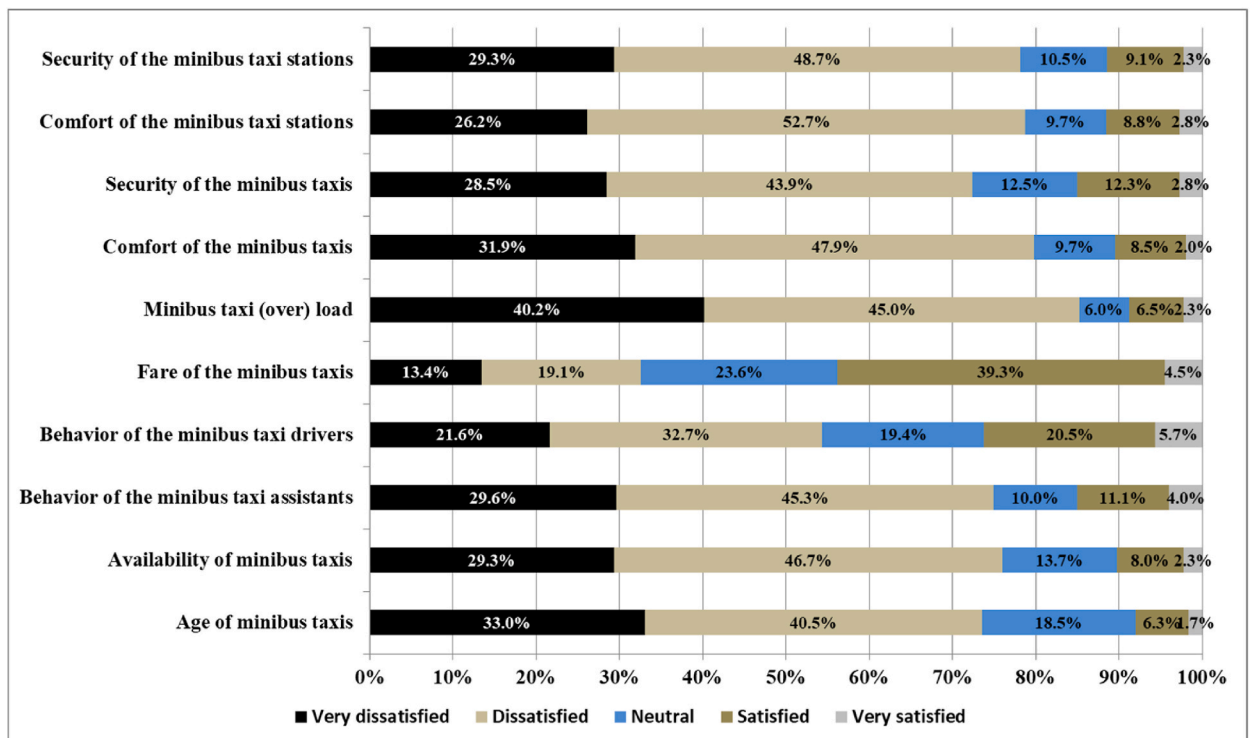

Fig. 3. Satisfaction towards different variables of minibus taxi service (N = 351).

minibus taxi overload (Fig. 3). This can be seen from day-to-day operation of the minibus taxi in Addis Ababa. The loading capacity of a minibus taxi was supposed to be 12 people, however, most of the time, especially during peak hours the taxi loads 18 to 20 people. Moreover, the age of the minibus taxi, availability, comfort and security inside the taxi and at the stations are other variables that has got higher rating in the 'dissatisfied' and 'very dissatisfied' category. This shows that the minibus taxi customers are not satisfied with their overall experience during boarding and alighting the taxi, and inside the vehicle. On top of this, 29.6 % and 45.3 % of the respondents reported that they are 'dissatisfied' and 'very dissatisfied' with the behavior of the minibus taxi assistants, respectively. Every minibus taxi in Addis Ababa has an assistant to the driver that collects fares and help passengers in and out of the taxi. Often, those assistants are too young; less educated and not well-behaved which cause passengers to dissatisfy with their behavior. As comparison, the dissatisfaction level towards the taxi drivers is relatively lower than that of their assistants. The results of the study show that, dissatisfaction level towards the minibus taxi service in the study area is very high. Regarding tariff of the minibus taxis, the respondents have little complaint. Only 32.5 % reported that they are unsatisfied (13.4 % very dissatisfied and 19.1 % dissatisfied) with the cost of using the taxi. This shows that Minibus taxis are one of the cheap public transportation alternatives in the city. The minimum fare for a shortest distance is 1.50 Ethiopian birr (0.05 US Dollar) and the maximum for longer one-way distance within a city may go up to 6 Ethiopian Birr (0.2 US Dollar). There are cases of paying more, especially for taxis reaching to the peripheral neighborhood of the city. The dissatisfaction with the availability of taxis is an indication that the minibus taxi is either scarce or the frequency is not as high as customers expected it. A long line observed in morning and the afternoon at taxi stations is a living proof for this.

4.4. Satisfaction level by age

As shown in Fig. 4 below, age groups from 25 to 34 years are dominant age group around the minibus taxi stations during data collection period. 25–34 age groups appreciated and complained the quality of service provided by minibus taxis more than any other age groups. So, 28.6 % of thoseage group are dissatisfied (10.5 % very dissatisfied and 18.1 % dissatisfied) and on the contrary 6.6 % of them are satisfied (1.4 % very satisfied and 5.2 % satisfied). The second dissatisfied age groups are those within 15–24 years sharing 20.6 % (9.7 % very dissatisfied and 11.9 % dissatisfied).

4.5. Satisfaction level by gender

The most dissatisfied response rate goes to male covering 29.1 % and 13.1 % for female. The next higher response rate goes to very dissatisfied having 18.9 % for males and 9.4 % for female. The satisfied level response rate shares 9.2 % for male and 3.8 % for female; while the least response rate is very satisfied level sharing 2.4 % for male and 0.7 % for female as can be seen in Fig. 5 below. The
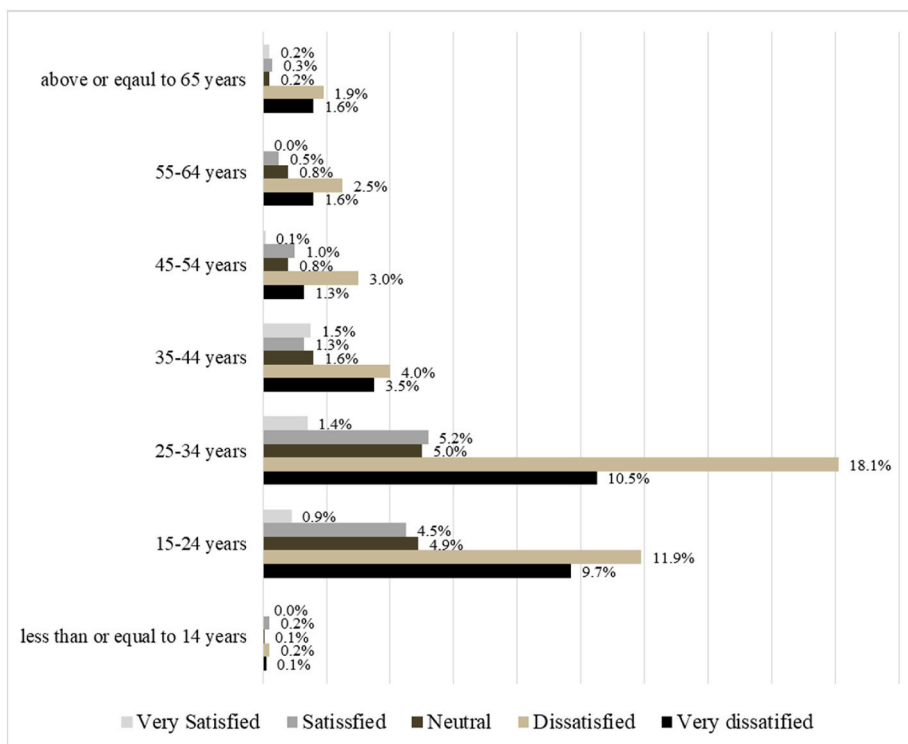

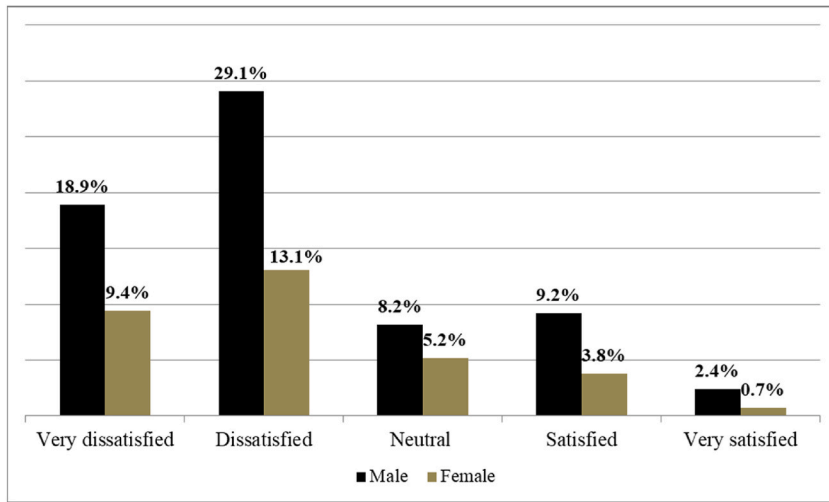**Fig. 4.** Satisfaction level by age.

Fig. 5. Satisfaction level by gender.

satisfaction/dissatisfaction response rate for female is low. This might be because there are lower numbers of female around minibus taxi stations than males during data collection period.

4.6. Satisfaction level by education level

Different category of education levels have various satisfaction rates about the service quality provided the Addis Ababa minibus taxis as can be seen from Fig. 6 below. From the all category of education levels, degree holders have highest dissatisfaction response rate with 14.7%dissatisfaction and 8.2 % very dissatisfaction response rate. Again, the degree holders responded highest response rate in satisfied category sharing 3.4 % of the total response categories. This might tell us that, the more people educated, the more they expect good service quality from the service providers.
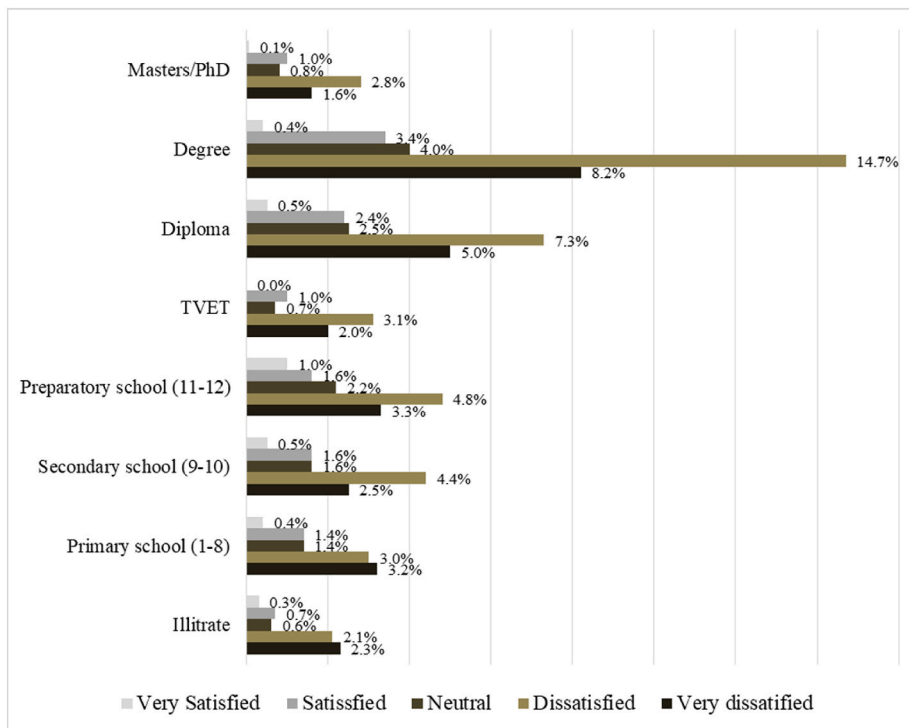

Fig. 6. Satisfaction level by education level.

4.7. Comparing means

The 10 different variable factors of the minibus taxi provide information on how customers view different components separately. Table 2 illustrates a comparison of those variables by means, median and mode (in descending order by means). Minibus taxi customers are not extremely satisfied with a single variable, with no variable gets a mean above three (out of five), except only one variable with a score above 3.0, which is fare of the minibus taxi. A variable with lowest score is minibus taxi (over)load, which draws a negative reaction from respondents. Other variables such as availability of minibus taxis, security of the minibus taxi stations, the age and comfort of the minibus taxis are also among the variables with low mean score.

4.8. Factor/principal component analysis

In order to decide on which satisfaction variables are important, factor analysis is conducted using SPSS software, which resulted in *two-factor* categories, explaining 53.12% of the total variance (Table 3). Individual satisfaction variables were grouped according to the factors they are in and given a group/factor label. Factor 1, labeled as *human and functional variables*, has a good reliability coefficient (α) of 0.816. The factor includes seven variables with factor loadings greater than 0.5. Those variables include behavior of the taxi drivers, behavior of the minibus taxi assistants, minibus taxi (over) load, age of minibus taxi, comfort of the minibus taxis, availability of minibus taxis, and fare of the minibus taxis. They explain 42.07% of the variance, meaning these seven variables have a higher relative importance to affect satisfaction of minibus taxi customers. Customers give priority for *human and functional* aspects of the minibus taxi service over the *comfort and security factors*. The second factor (α = 0.720) includes three variables, labeled as *comfort and security factors*. These include security at the minibus taxi stations, security in the minibus taxis, and comfort of the minibus taxi stations. These three factors explain only 11.04% of the total variance, being the least important factor to determine customers' satisfaction.

The seven satisfaction variables under Factor 1 are chosen from the list of variables since they have a higher variance and will be included in the ordered logit model analysis. In this situation, the factor analysis is successfully helped to reduce the number of variables used for further analysis.

4.9. Results of ordered logit model

The results of the ordered logit model are presented in Table 4. The dependent variable is an ordered response of respondent's satisfaction with 7 important service parameters of the minibus taxi identified by the factor analysis. A p-value with less than 0.05 are strictly used to look into relationships between the satisfaction variables, and the explanatory variables. However, p-value between 0.05 and 0.1 are also considered to see what explanatory variables are marginally related to satisfaction variables. As it is important for ordinal regression model, analysis of the parallel line assumption was conducted in order to prove that the independent variables remain constant for various categories of the dependent variables. To test the parallel line assumption, log likelihood is distributed with chi-square. The result shows that all the dependent variables have log likelihood differentials above the chi-square cutoff values for the given degrees of freedom and significant level (refer Table 4).

According to Table 4, peak-hour waiting time and minibus taxi preferability are the two variables statistically significant with p < 0.05 for satisfaction with *comfort inside the minibus taxi*. The number of transfer and unemployment are variables statistically significant with p < 0.1 (90 % confidence level). The positive beta value with minibus taxi preferability shows for those who prefer taxis as their main mode of travel have higher likelihood of being satisfied with taxi comfort. Whereas, those who make several transfers to get to their destination, are unemployed and those who have longer waiting time have less likelihood of being satisfied with taxi comfort. This is important because long-distance travelers experience waiting at origin stations as well as when they transfer from one route to the other. When satisfaction with *station comfort* is concerned, age, number of transfers, minibus taxi preferability, being divorced and a student are important statistically significant variables with p-value less than 0.05. The negative sign associated with the beta coefficient of age, number of transfers, and being a student shows that elderly taxi customers, students, and those making several transfers have a high likelihood of being dissatisfied with the comfort inside the taxi. The low level of satisfaction was emanated from the fact that taxis are crowded (overloaded) and not convenient. However, in the case of this study, those who prefer minibus taxi as

Table 2
Respondents' satisfaction with minibus taxi service aspects.

Minibus taxi performance factors	Mean	Median	Mode	Standard Deviation
Fare of the minibus taxis	3.03	3	4	1.14
Behavior of the taxi drivers	2.56	2	2	1.20
Security of the minibus taxis	2.17	2	2	1.06
Behavior of the minibus taxi assistants	2.15	2	2	1.09
Comfort of the minibus taxi stations	2.10	2	2	0.98
Availability of minibus taxis	2.07	2	2	0.98
Security of the minibus taxi stations	2.06	2	2	0.98
The age of minibus taxi	2.03	2	2	0.96
Comfort of the minibus taxis	2.01	2	2	0.97
Minibus taxi (over)load	1.86	2	2	0.95

Table 3
Factor analysis of satisfaction components of minibus taxi.

	Factor 1	Factor 2
Human and functional variables		
Behavior of the taxi drivers	0.752	
Behavior of the minibus taxi assistants	0.732	
minibus taxi (over) load	0.669	
Availability of minibus taxis	0.632	
Comfort of the minibus taxis	0.617	
The age of minibus taxi	0.605	
Fare of the minibus taxis	0.591	
Comfort and security variables		
Security of the minibus taxi stations		0.806
Security of the minibus taxis		0.75
Comfort of the minibus taxi stations		0.745
Eigenvalue	4.207	1.104
Variance (%)	42.073	11.042
Cumulative variance (%)	42.073	53.116
Reliability coefficient	0.816	0.720

their main mode of travel seems not to care about comfort.

Minibus taxi preferability is still significant for satisfaction with the *fare oftravel*. Along with preferability, marital status-single and divorced also are statistically significant with a90 % confidence level. The positive beta coefficient shows that those variables are positively related to satisfaction with the fare of a minibus taxi. This coincides with the descriptive results in the previous section that fare is the only variable that respondents are satisfied with. Experience of having been stolen while catching a taxi and taxi preferability are two common statistically significant variables for *satisfaction with the behavior of drivers and assistants*. Those who have past experience of being pick-pocketed have a lesser likelihood of being satisfied with drivers and their assistants' behavior whereas for those who prefer minibus taxis, this matters the least. Educational status is a variable, which is statistically significant for satisfaction with *drivers' behavior*. The negative beta value shows that the more educated the respondents are, the less likely they have to be satisfied with drivers' behavior.

Regarding satisfaction with *availability of taxis (frequency)*, the number of transfers, minibus taxi preferability, and marital status is statistically significant variables. Especially, the number of transfers and satisfaction with the availability of minibus taxis is negatively related in this study. This only makes sense because the scarcity of minibus taxis is evident throughout the city, especially during morning and afternoon peak hours.

When a person has to transfer from taxi to taxi to reach the destination (which is common), the waiting time adds up and contributes to the dissatisfaction of customers with the taxi service. Gender is an important variable, which is statistically significant for satisfaction with the *age of the minibus taxi* (most of the minibus taxis are very old). The negative sign attached to the gender variable shows that male respondents are not satisfied with the age of the taxi. The opposite is not necessarily true, and this does not imply that female respondents are satisfied with the age of the taxi vehicle. For statistical reasons, gender-female is kept as a reference variable. Full-time and part-time workers are statistically significant with positive beta values, indicating that they have a higher likelihood of being satisfied with the age of a minibus taxi vehicle. From the ordered logit model, one important finding stands out. Those who said minibus taxi is their preferred mode of travel showed a higher probability of being satisfied with the overall performance and quality of the minibus taxi service.

This is an indication that for daily or captive customers, the service quality does not matter more than reaching their destination. For a big city like Addis Ababa where the transportation demand is far from the supply, accessing one's destination such as work, or school is not a luxury but a necessity, therefore, riders use the service despite its poor quality. Also, interesting, those who make chained trips with several transfers have high level of dissatisfaction towards several service factors.

5. Discussion and conclusion

5.1. Discussion

This study used a variety of analysis techniques, including descriptive analysis, mean comparison, factor/principal component analysis, and an ordered logit model. The most unsatisfactory service in Addis Ababa minibus taxi was taxi overload. From the descriptive analysis, 85.2 % (299 out of 351) of the customers felt inconvenience about minibus taxi overload sharing 40.2 % very dissatisfied and 45 % dissatisfied respondents from customers. According to studies by Refs. [1,34], taxi overload reduced the customers' satisfaction.

Concerning the minibus taxi availability, 76 % of the customers are unhappy (29.3 % very dissatisfied and 46.7 % dissatisfied). As we can see from the above result taxi overload is likely to be affected by availability of minibus. Since customers do not get minibus taxis when they need it, they choose to be overloaded on available minibus taxis, especially during morning and afternoon/off work time. When the waiting time of minibus taxis assessed, 41 % of the customers during peak hours and 19 % of the customers during off-peak hours wait for a taxi for more than 30 min (see Table 1).

Table 4
Ordered logit model results.

	Taxi comfort		Minibus load		Taxi fare		Behavior of taxi drivers		Behavior of taxi assistants		Availability of taxis		Age of taxi	
	B	Sig.	β	Sig.	β	Sig.	B	Sig.	β	Sig.	β	Sig.	β	Sig.
[Threshold = 0]	−1.06	0.43	3.32	0.02	1.19	0.36	0.90	0.49	0.44	0.74	2.40	0.09	1.69	0.26
[Threshold = 1]	1.24	0.35	5.65	0.00	2.40	0.07	2.51	0.06	2.58	0.06	4.59	0.00	3.55	0.02
[Threshold = 2]	2.06	0.12	6.28	0.00	3.43	0.01	3.45	0.01	3.24	0.02	5.65	0.00	5.03	0.00
[Threshold = 3]	3.87	0.01	7.77	0.00	6.30	0.00	5.32	0.00	4.72	0.00	7.25	0.00	6.65	0.00
[Age = ≤14]	1.89	0.17	−2.43	0.28	2.08	0.16	1.40	0.30	0.96	0.49	1.95	0.15	−0.20	0.90
[Age = 15–24]	0.34	0.51	−0.16	0.77	0.39	0.42	0.75	0.14	0.92	0.08[a]	0.24	0.64	0.85	0.10
[Age = 25–34]	0.28	0.58	0.20	0.69	0.51	0.30	0.77	0.12	0.96	0.07[a]	0.40	0.44	0.74	0.15
[Age = 35–44]	−0.56	0.33	−0.56	0.33	0.48	0.38	0.63	0.26	0.43	0.46	0.63	0.27	0.76	0.18
[Age = 45–54]	0.17	0.79	0.07	0.91	0.41	0.50	1.00	0.10	1.36	0.03[b]	0.19	0.76	1.248	0.05[b]
[Age = 55–64]	−0.41	0.53	−0.13	0.84	−0.05	0.94	1.92	0.14	0.60	0.36	0.01	0.99	0.40	0.54
[Age = ≥65]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Educational status	−0.05	0.39	−0.01	0.82	0.08	0.15	−0.13	0.01[b]	−0.03	0.61	−0.02	0.76	0.06	0.28
Number of transfers	−0.20	0.07[a]	−0.39	0.00[b]	0.12	0.27	−0.15	0.16	−0.01	0.95	−0.22	0.04[b]	−0.08	0.45
Peak-hour waiting time	−0.25	0.04	0.20	0.11	−0.05	0.66	0.04	0.71	−0.07	0.58	−0.05	0.71	−0.09	0.48
Off-peak hour waiting time	0.11	0.30	0.01	0.93	0.00	0.99	−0.15	0.13	−0.07	0.53	0.03	0.75	−0.04	0.69
Got stolen while using minibus taxi	−0.02	0.85	−0.07	0.54	−0.09	0.36	−0.24	0.02[b]	−0.21	0.05[b]	0.14	0.17	0.15	0.16
Home to station walking distance	0.03	0.73	−0.01	0.92	−0.03	0.64	0.10	0.17	−0.05	0.46	0.03	0.69	−0.03	0.69
Minibus taxi preferability	0.26	0.04[b]	0.54	0.00[b]	0.35	0.00[b]	0.47	0.00[b]	0.42	0.00[b]	0.39	0.00[b]	0.36	0.00[b]
[Gender = male]	0.27	0.25	0.14	0.56	0.13	0.58	0.07	0.77	0.19	0.42	0.16	0.50	−0.44	0.05[b]
[Gender = female]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
[Marital status = single]	1.10	0.27	0.83	0.40	1.71	0.07[a]	2.30	0.02[b]	0.71	0.48	1.74	0.09[a]	1.41	0.23
[Marital status = married]	0.93	0.35	1.10	0.27	1.53	0.12	2.16	0.03[b]	0.51	0.62	1.92	0.07[a]	1.24	0.30
[Marital status = divorced]	0.29	0.84	2.82	0.04[b]	2.35	0.08[a]	2.17	0.11	0.38	0.79	3.55	0.01[b]	1.38	0.36
[Marital status = widowed]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
[Occupation = student]	−0.18	0.68	0.91	0.05[b]	0.49	0.25	0.02	0.96	0.59	0.18	0.48	0.28	0.72	0.11
[Occupation = full time]	−0.66	0.11	0.51	0.24	0.05	0.91	−0.03	0.95	0.41	0.33	0.26	0.54	0.81	0.05[b]
[Occupation = part time]	−0.91	0.10	0.28	0.61	0.19	0.71	−0.22	0.68	−0.08	0.89	0.29	0.59	1.10	0.04[b]
[Occupation = unemployed]	−0.86	0.09[a]	0.17	0.74	−0.40	0.41	−0.01	0.98	0.49	0.33	−0.01	0.98	0.45	0.37
[Occupation = housewife]	−1.03	0.13	−0.30	0.67	0.66	0.31	−0.03	0.96	−0.94	0.17	1.37	0.04[b]	−0.09	0.90
[Occupation = retired]	−1.29	0.14	−0.94	0.30	−0.49	0.55	−1.31	0.13	−1.55	0.10	−1.25	0.16	−0.36	0.68
[Occupation = other]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Likelihood Ratio Chi-Square	34.	76	42.	29	28.	27	48.50		41.15		32.73			32.04

[a] Statistically significant with 90 % confident level.
[b] Statistically significant with 95 % confident level.

On the contrary, the fare of minibus taxi is the service quality that the customers least complain about covering 32.4 % (13.4 % very dissatisfied and 19.1 % dissatisfied). The mean score and the factor analysis result in this study also shows that the minibus taxi fare is the variable that riders are complaining less about. Although shared minibus taxis in Addis Ababa are not the cheapest alternatives (compared to regular buses), the satisfaction shows that riders are willing to pay for the service and their satisfaction with taxi fare is unaffected as much as with other variables. In a city where the elasticity of demand is low, price is not found out to be a deal-breaker to affect riders' satisfaction. In supporting the above result, according to Ref. [35], when public transport is provided throughout the city, it should give consideration to those in need, the urban poor. Again, the study by Ref. [36] reveals that the fare of public transportation is said to meet customer satisfaction when reasonable fare charges meet the majority of passenger's demand.

Form the factor analysis and ordered logit model result, the human factors such as drivers' and assistants' behaviors are variables with which riders show greater dissatisfaction. Similarly, the result of a study conducted by the researchers show that, the driver behavior of the taxis was the most important factor of passengers' overall service quality [30]. According to the factor analysis, the *comfort and security* factors are not as important as the human and functional variables showing that riders weigh more on the functionality of the service than their comfort and security. This is not to mean that comfort and security are not important but, in a city, where the supply of transportation is low, people are willing to compromise their comfort for getting to their destination on time. Contrarily, a study conducted in Kenya in 2010 found that comfort was a key service factor that contributed to more enticing public transportation [37]. Additionally, a different study [34] discovered that comfort is one of the elements that influence people to select one mode over another. A low level of crowding, good standards of cleanliness, and comfortable seats are some of the practical variables that contribute to the high degree of passenger comfort, according to Ref. [38].

The ordered logit model results show that, those who are dissatisfied with the taxi drivers and their assistants' behavior are those had been stolen at least once during their previous travel with a minibus taxi. Forty (40) percent of the customers were pick-pocketed at least once at the minibus taxi stations. (see Table 1). In addition, those who make long trips with several transfers were either dissatisfied or very dissatisfied with the many variables of the minibus taxi service. During their trips, the customers that transferred at least once covers 88 % (17 % one-time transfer, 33 % two times transfer, and 38 % more than two-time transfer) of the total respondents (see Table 1). However, according to the previous study by Ref. [38], the passengers were satisfied when they completed their journey without having to transfer. As can be seen from the ordered logit model analysis, the respondents who prefer minibus taxis as means of transport were those who tolerate unsatisfactory service attributes in a minibus taxi. So mixed technique of data analysis used in this study helped to analyze a broad range of service quality indicators can be seen as its strength. However, since there was no standard type and number of indicators to measure the customer satisfaction in public transport in general and minibus taxis in particular. The previous authors have used different satisfaction indicators to assess customer satisfaction in public transportation and minibus taxis. Thus, this study tries to address a wide range of satisfaction issues in minibus taxis of Addis Ababa by using 15 different variables. To assess this wide range of satisfaction factors, 3 methods were used. As the result, conducting the study requires much time and energy. So, the future researchers have to set the standard number and type of variables used to assess the quality of customer satisfaction in public transportation and minibus taxis.

5.2. Conclusion

Shared taxi service covers most trips made in Addis Ababa city, as is the case in many developing countries. Given its growing importance of meeting the ever-increasing transportation demand, promoting a good quality service is important. To promote the use of public transportation, planning for shared taxi service (as part of public transportation) needs to include the views and perspectives of those who use the service. Since there was no research done on customer views and perspectives with minibus taxis in Addis Ababa, there is a need to study customers' satisfaction towards the service quality in minibus taxis. The collected data were analyzed through descriptive and three steps processes starting from comparing means of satisfaction responses, and then factor/principal component analysis followed by an ordered logit model. Thus, the result of descriptive analysis, mean score and the factor shows that, the minibus taxi overload is the service that the customers complain the most about.

This is an indication that the number of minibus taxis in the city should be increased and the minibus taxi should be deployed according to demand at minibus taxi stations. There should also be provision of alternative modes of public transportation in Addis Ababa city. The factor/principal component analysis result shows that the human factors such as drivers' and assistants' behaviors are variables with which riders show greater dissatisfaction. This is one possible intervention area for service providers. Taxi drivers and their assistants need customer service trainings. The license issuing process need to include training on soft skills such as interpersonal communication for drivers' and assistants of minibus taxis as well. The ordered logit model results show that, those who are dissatisfied with the taxi drivers and their assistants' behavior are those had been stolen at least once during their previous travel with a minibus taxi. In addition, those who make long trips with several transfers were dissatisfied with the many variables of the minibus taxi service. Thus, to improve the services that many riders are dissatisfied with, the minibus taxi owners (service providers), Addis Ababa Road Authority (to give customer service trainings for drivers and assistants, regulate licensing issue) and security personnel (to keep the security and safety of customers) should work together on improving the minibus taxi service that many riders are dissatisfied with.

Ethical approval

This work was approved by Wollega University Research Ethics Review Committee on September 2020 with ethics approval number of 0348/2020. As completion of the questionnaire implies consent to participate, the respondents consent was obtained for the information gathered from the people and the confidentiality of the information was respected.

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Data availability statement

Data will be available based on the request.

CRediT authorship contribution statement

Gebeyew Tadesse Deyas: Writing – original draft. **Mintesnot Gebeyehu Woldeamanuel:** Methodology. **Sitotaw Haile Erena:** Writing – review & editing.

Declaration of competing interest

We declare that we have no any conflicting interest.

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Appendix A. Supplementary data

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