



Assessing and Prioritizing Perceived Service Quality in Healthcare Settings in Nepal: A Multi-Criteria Decision Analysis Using Analytical Hierarchy Process (AHP)

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Abstract

This study uses the Analytical Hierarchy Process (AHP) to compare and assess different private healthcare facilities in Nepal according to perceived service quality. For methodology, first, the criteria for the study were established and rated and then sensitivity analysis was carried out to evaluate the decision using AHP to rank healthcare according to the characteristics of service quality and the relative positions. The data were collected from eleven hospitals in Kathmandu, Nepal. SERVQUAL dimensions were used in order to comprehend the Perceived Service Quality. The analytical procedure was carried out using Expert Choice software. The study shows that Private Teaching Hospitals have the highest Perceived Service Quality among patients, followed by Public Teaching Hospitals and that patients value tangibility over other service aspects. The study provides insights into the characteristics of service quality in Nepalese hospitals. The findings help healthcare managers to understand the factors that patients consider important to improve service quality.

Introduction

Quality has emerged as a crucial component of any organization's success and survival, making it a major concern in the majority of service industries, particularly the health care industry, where quality permeates every step of the process, from welcoming patients to providing all professional services (Cruz & Mendes, 2019). Flood (1993, p. 226) argues that quality is "meeting customers' (agreed) requirements, formal and informal, at the lowest cost, first time and every time". Leebov et al. (2003) suggests that receiving high-quality medical treatment is morally and ethically right. They argue that providing high-quality healthcare entails doing the right things correctly and continuously improving; it also entails achieving the best clinical outcome, ensuring the satisfaction of all patients, keeping skilled employees, and sustaining stable financial performance.

Quality is the result of the experience that a patient receives at the hospital. It is based on how medical staff members handle and interact with patients.

(Niraula & Poudel, 2019). According to Wu, Liu & Hsu (2008) In the context of healthcare services, customer-perceived value and perceived service quality are antecedents to behavioral intentions and satisfaction. Reproducing



consistent healthcare services is frequently challenging since they vary depending on the providers, recipients, locations, and times. This “heterogeneity” can happen when patients with diverse requirements are served by various professionals (such as doctors, nurses, etc.) (Mosadeghrad, 2013). Over the last three decades, service quality and its results have been among the few areas in the services marketing literature to garner extensive academic investigation. The demand for improved and better healthcare service quality has increased, putting pressure on the supply side (i.e., service providers) and making it difficult for researchers, hospital administrators, government policymakers, and therapeutic specialists to meet the needs of patients, which helps to build satisfaction and loyalty. (Al-Borie and Sheikh Damanhour, 2013; Fatima, Malik, & Shabbir, 2018; Kondasani, Panda, & Basu, 2019; Ranaweera and Prabhu, 2003).

AHP was developed by Saaty, T.L. (1980). Multi-criteria decision making (MCDM) method is highly effective in assessing service quality and is applied in various fields such as industry, agriculture, and environmental studies. It is also used for cost-benefit analysis and decision-making related to nutrition, risk assessment, hospital location and rehabilitation issues (Talib, Rahman, & Qureshi, 2011b; Sipahi & Timor, 2010; Azam, Qureshi, & Talib, 2015). It was created in response to finding out simple to use and straightforward approaches that make it possible to make complicated decisions. Since then, the AHP has been used extensively throughout the world in a variety of domains due to its strength and simplicity (Naseh, 2018). To address pressing problems in the healthcare system, researchers have employed a range of multi-criteria decision making (MCDM) approaches over the last few decades, including the analytic hierarchy method (AHP). Decisions about how to assess service quality can be made in a variety of ways in the healthcare and medical industry (Al Awadh, 2022). This paper’s main goal is to evaluate and contrast how different healthcare settings in Nepal are perceived to offer quality care using analytical hierarchy process (AHP). The study aims to help the healthcare professionals, and legislators to make well-informed decisions regarding the service quality dimension.

Literature Review

Healthcare in Nepal

Nepal is mostly rural (80.26%) and one of the least developed countries in the world when it comes to health care. (World Bank, 2019). Modern healthcare services in the country started with the establishment of the first hospital, Bir Hospital in 1889. In Nepal, the health sector restructuring process formally started after the establishment of health sector reform committee in 1999. After the reinstatement of democracy in 1990, national health policy was formed in 1991 that prioritized the upgradation the health. It was after 1991, the door was open to the private sector to enter the healthcare industry. Chaudhary Group started Norvic International Hospital (previously Norvic Health Care & Research Centre Pvt. Ltd.) in 1993 as the first private hospital with 30 beds. According to objectives, hospitals in Nepal are classified into General Hospital, Specialized hospital, Teaching-com-research hospital, and Isolation hospital. The Nepal Health Facts Sheet 2023, released by the Department of Health Services (DoHS) suggested there are a combined 14,313 registered health facilities delivering services under the oversight of the DoHS reporting system (DOHS, 2023). Nepal’s 2015 constitution assured basic health care as a fundamental right. The National Health Insurance Act and National Health Institution Quality Authority Act of 2017 is thought to expand quality health service coverage. Until fiscal year 2017/18, Nepal Government health expenditure as a fraction of the GDP remained unchanged. However, it saw an increase to 1.5 percent in FY 2017/18, further rising to 2.2 percent in FY 2019/20, and eventually reaching 2.4 percent in FY 2020/21 (Dahal, Dahal, & Forum, 2023) This suggests a gradual but noticeable increase in the government’s allocation of funds towards healthcare over the time.

Measures of perceived service quality in healthcare

A common way to conceptualize service quality is to compare expectations with perceptions of the services’ actual performance (Zeithaml and Bitner, 2003). As per the findings of Karyose, Astuti, and Ferdiansjah (2017), good quality is viewed from the customer’s perspective and not from the standpoint of the service provider. Parasuraman & Associates, Inc. Service quality is “the difference between perceived service level and customer expectations,”

according to (1985, 1988). The SERVQUAL model was put forth by Parasuraman and associates. (1985) to gauge the degree of client contentment. In 1988, Parasuraman et al. With items reflecting both expectations and perceived performance, the SERVQUAL model proposed a five-dimensional construct of perceived service quality: tangibles, reliability, responsiveness, assurance, and empathy. The study by Parasuraman served as the foundation for the dimensions used in this investigation to assess the quality of healthcare services. Another helpful tool for evaluating the quality of health services to see long-term improvements is the Servqual method. In and outpatient medical service providers use it to gauge patient satisfaction and determine quality factors (Jonkisz, Karniej, & Krasowska, 2021).

Empathy: Robledo (2001) posits that empathy is the ability to be approachable, easily accessible, and to try to comprehend the needs of customers. When a customer receives personalized attention, such as when handling claims or accidents, empathy is demonstrated. According to Kaura et al. (2012) the people component of service quality influences how this dimension of quality is perceived. Tangibles: The physical attributes of personnel, equipment, facilities, and communication materials are referred to as tangibles. Other concrete aspects of care are the state of the physical surroundings, such as their cleanliness and noise level (Parasuraman, 1991). In order to build strong, positive, and inspiring customer associations and experiences through its proprietary assets, service delivery firms place a premium on tangibles (Naidoo, 2014).

Responsiveness: The willingness or preparedness of the service provider to provide a prompt service is known as responsiveness (Parasuraman et al. 1985). Berry with others. (2006) defined responsiveness as the speed at which service providers address and successfully address customer complaints. Being responsive means having the ability to assist clients and deliver services on time. This dimension focuses on being alert and timely in handling customer requests, inquiries, complaints, and issues. Customers can gauge an organization's responsiveness by the amount of time it takes to assist them, respond to their inquiries, or address issues. Reactiveness also encompasses flexibility and the capacity to tailor services to meet their needs (Hennayake, 2017).

Assurance: This dimension pertains to staff awareness, politeness, and the capacity to inspire confidence and trust (Ahmed, Tarique, and Arif, 2017). Honesty, believableness, and dependability are necessary for communicating confidence and trust. It entails considering factors like contact personnel qualities with the customer's best interests in mind (Kitapci et al. (2014).

Reliability: Lovelock and Wright (1999) defined reliability as the capacity to deliver the promised service precisely and consistently. Mudie and Pirrie (2006) state that the capacity to deliver the promised service precisely and consistently.

Service quality that is based on perception is very culturally specific. Studies designed with Western conceptualization fail to disclose patients' attitudes, ideas, and self-concepts in the same way that Asian studies do. These ideas are critical to understanding a patient's experience with illness, expectations, and views of readily available healthcare services (Humayun, Iqbal, Shafiq, and Fatima, 2019). The ability of the AHP to produce numerical priorities from the subjective knowledge represented in the paired comparison matrices is one of its best qualities. The approach works well for weighing hospitals according to different criteria. The current study is a step toward creating an AHP-based supplier selection method that will be used in Nepali healthcare. Developing a straightforward decision support methodology is crucial for healthcare managers to comprehend the quality factor that matters to patients and adjust their strategies accordingly.

Analytic Hierarchy Process

When one must compare multiple banks based on their respective business models, the issue becomes far more intricate. A model needs to be created for such intricate issues. The model presented in this paper is based on Saaty's (1980)

Analytic Hierarchy Process.

There are four steps involved in explaining the application of the method:

1. The decision problem hierarchy model is constructed with the goal at the top, criteria and sub-criteria at

- lower levels, and alternatives at the bottom. A general model like this is shown in figure 1.
2. All possible pairs of the elements at each level of the hierarchy structure should be used to perform pairwise comparisons. The 1-3-5-7-9 scale's numerical values, which correspond to the decision maker's verbally described intensities, represent their preferences (Saaty, 1980).
 3. The hierarchy structure's components criteria, sub-criteria, and alternatives—have their relative significance (weights) determined by pairwise comparisons. These weights are then combined to create an overall list of priorities for the alternatives.
 4. The completion of the sensitivity analysis.
- Utilizing a square matrix of pair-wise comparison $A = [a_{ij}]$, which is positive and reciprocal if the paired comparison judgment is perfectly consistent, the AHP work entails estimating the priority weights of a set of criteria or alternatives. E. therefore for all $ij = 1, 2, 3, a_{ij} = 1/a_{ji}$. in, n

The final normalized weight of its i -th factor, w_i , is given by

$$w_i = a_{ij} / \left(\sum_{k=1}^n a_{kj} \right) \quad \forall i = 1, 2, \dots, n. \tag{1}$$

In the real life judgment, an error on the judgment is unavoidable. The suggested eigenvalue method computes were the principal right eigenvalue of the matrix A or w satisfies the following system of n linear equations:

$A w = \lambda_{max} w$, where λ_{max} is the maximum eigenvalue of A .

This is to say that.

$$w_i = \frac{\sum_{j=1}^n a_{ij} w_j}{\lambda_{max}} \quad \forall i = 1, 2, \dots, n. \tag{2}$$

The natural measure of inconsistency or deviation from consistency, called consistency index (CI) is defined as

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{3}$$

The table 1, displays the consistency index of a random index (RI) reciprocal matrix, which is a randomly generated matrix with reciprocals forced from scale 1 to 9, for each size of matrix. Next, the consistency ratio (CR) can be expressed as follows: $CR = CI / RI$, which is the ratio of CI to RI for matrices of the same order. A value of CR less than 0 points is usually regarded as an appropriate limit. In most cases, the decision maker must reduce inconsistencies by revising his judgments; higher values are needed to correct consistency. In order to determine the overall priorities of the alternatives in relation to the goal or objectives, the other task in the hierarchy is the synthesis of the judgments made throughout the hierarchy. The weights are produced by adding up each element's priority in accordance with a particular criterion and then subtracting that weight from the total. The following is a pair-wise comparison scale: 1 (equal), 3 (weak), 5 (strong), 7 (very strong), 9 (absolute), 2, 4, 6, and 8 (intermediate values) for evaluating the relative importance of the factors used in the AHP subjective judgment.

Table 1: Random Index (RI)

Matrix Order	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Aggregation: The last step is to synthesize the local priorities across all criteria in order to determine the global priority. The historical AHP approach (called later distributive mode) adopts an additive aggregation with

normalization of the sum of the local priorities to unity.

$$P_i = \sum_{j=1}^n W_j \cdot l_{ij} \tag{5}$$

where P_i : global priority of the alternative I, l_{ij} : local priority, W_j : weight of the criterion j

Objectives

The objectives of this study are given below:

- a. To serve as a basis for further research in this field and to offer a thorough evaluation of the literature on service quality.
- b. To use the AHP method to determine which healthcare services, based on the SERVQUAL dimensions, provide patients with the best overall value.
- c. To develop a hierarchical AHP-based model to rank the SRVQUAL dimensions.

Research Design/Methodology

According to the literature review of service quality dimensions a conceptual model for a decision problem must be developed. The study model uses 5 dimensions. Four healthcare providers i.e Public hospitals, Private hospitals, Private Teaching Hospital and Public Teaching Hospital were chosen to analyze the quality of perceived quality of healthcare. The identities are kept hidden by keeping their names anonymous. In addition to several comparison tables with the five dimensions of service quality, an AHP-based questionnaire was designed, developed, and administered. The model was developed using the AHP approach, as shown in Figure 1, which shows a step-by-step assessment of the top healthcare services.

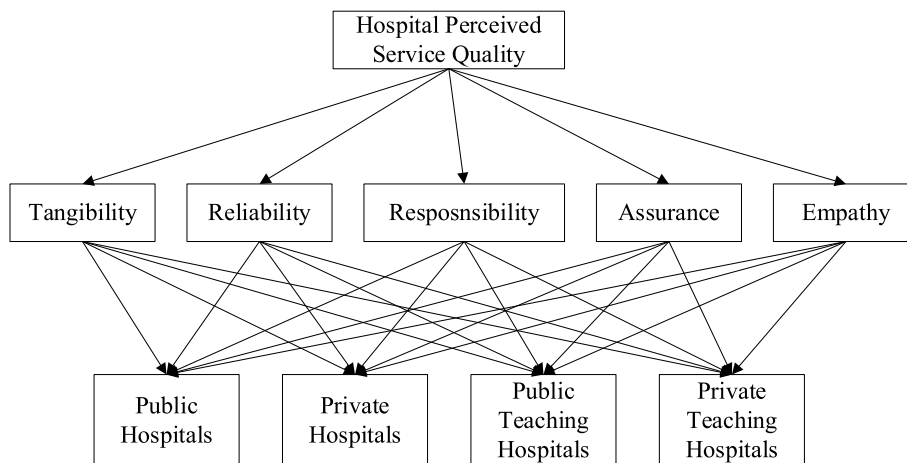


Figure 1: Hospital Perceived Quality AHP Model

Performance Evaluation of Hospitals by AHP

Expert Choice Software version was utilized to construct the set of AHP questionnaires. 11. A thorough review of the literature and the opinions of experts were used to define the parameters that determine the hospital service quality. The questionnaire prepared were distributed to a group of Patients and corresponding results were synthesized. A total of 11 random Patients who had visited hospitals within 3 months’ time were provided with the questionnaire. The questionnaire analysis were interpreted through Expert Choice ver. 11 Software. One expert posed as facilitator with who the researchers built the Expert Choice model. While other members evaluated the model as participants. The information provided by the participants, including the facilitator, was processed to produce eigenvalues, consistency indices, and consistency ratios. These metrics showed that the respondents’ judgmental values were consistent where Consistency indices (CI) were less than 0.1. Yet, the choices were examined for compliance with the CI. The combined pairwise comparison matrices are displayed in the following tables.

Table 2: Priorities

Level 1	Alts	Prty
Percent Reliability (L: .225)		22.5
Reliability (L: .225)	Public Hospitals	0.016
Reliability (L: .225)	Private Hospitals	0.057
Reliability (L: .225)	Public Teaching Hospitals	0.081
Reliability (L: .225)	Private Teaching Hospitals	0.071
Percent Assurance (L: .113)		11.3
Assurance (L: .113)	Public Hospitals	0.012
Assurance (L: .113)	Private Hospitals	0.033
Assurance (L: .113)	Public Teaching Hospitals	0.021
Assurance (L: .113)	Private Teaching Hospitals	0.047
Percent Tangibility (L: .375)		37.4
Tangibility (L: .375)	Public Hospitals	0.08
Tangibility (L: .375)	Private Hospitals	0.061
Tangibility (L: .375)	Public Teaching Hospitals	0.144
Tangibility (L: .375)	Private Teaching Hospitals	0.089
Percent Responsiveness (L: .225)		22.5
Responsiveness (L: .225)	Public Hospitals	0.018
Responsiveness (L: .225)	Private Hospitals	0.097
Responsiveness (L: .225)	Public Teaching Hospitals	0.035
Responsiveness (L: .225)	Private Teaching Hospitals	0.075
Percent Empathy (L: .062)		6.2
Empathy (L: .062)	Public Hospitals	0.007
Empathy (L: .062)	Private Hospitals	0.023
Empathy (L: .062)	Public Teaching Hospitals	0.011
Empathy (L: .062)	Private Teaching Hospitals	0.021

The analysis prioritized tangibility, identifying Public Teaching Hospital as the preeminent choice in this domain. Subsequently, reliability and responsiveness came second. Public Teaching Hospital demonstrated the highest reliability, whereas Private Hospitals excelled in responsiveness. Assurance ranked fourth, with Private Teaching Hospital exhibiting the most robust assurance factor. Lastly, empathy was examined with Private Hospital topping the list.

Table 3: Pairwise Comparison Matrix With respect to Overall Goal

	Assurance	Tangibility	Responsiveness	Empathy
Reliability	3.7161	2.29828	1.1808	3.33945
Assurance		1.95703	3.04676	2.64862
Tangibility			3.01772	3.53441
Responsiveness				4.02395
Empathy	Inconsistency: 0.08			

The observation shows that the total inconsistency was assessed and determined to be 0.0, which is less than 0.1. This verifies the AHP model and the pairwise comparisons employed in the study. Table shows that the judgment is consistent since the inconsistency ratio is 0.08 which is less than 0.10.

Table 4: Normalized Ranking of Reliability

Combined Instance with respect to Reliability	
Alternative	Priority
Public Teaching Hospitals	1
Private Teaching Hospitals	0.878
Private Hospitals	0.703
Public Hospitals	0.193

Table 5: Normalized Ranking of Assurance and Tangibility

Combined Instance with respect to Assurance		Combined Instance with respect to Tangibility	
Alternative	Priority	Alternative	Priority
Private Teaching Hospitals	1	Public Teaching Hospitals	1
Private Hospitals	0.713	Private Teaching Hospitals	0.619
Public Teaching Hospitals	0.442	Public Hospitals	0.554
Public Hospitals	0.249	Private Hospitals	0.424

For Assurance, the result showed that Private Teaching Hospitals are the most dependable of the options analyzed for this criterion with normalized score as 1.

Private Hospitals, Public Teaching Hospitals and Public Hospitals follow with a score of 0.713, 0.442 and 0.249 respectively. Public Hospitals are perceived as the least assuring option among the choices. For Tangibility, Public Teaching Hospitals have a normalized score of 1 which indicates that they are considered the most tangible option among the choices evaluated. Private Teaching Hospitals have a normalized score of 0.619. Public Hospitals have a normalized score of 0.554, indicating a moderate level of tangibility and Private Hospitals have the lowest score of 0.424 which suggesting they are perceived as the least tangible option.

Table 6: Normalized Ranking of Responsiveness and Empathy

Combined Instance with respect to Responsiveness		Combined Instance with respect to Empathy	
Alternative	Priority	Alternative	Priority
Private Hospitals	1	Private Hospitals	1
Private Teaching Hospitals	0.771	Private Teaching Hospitals	0.929
Public Teaching Hospitals	0.359	Public Teaching Hospitals	0.48
Public Hospitals	0.187	Public Hospitals	0.29

In the test focused on Responsiveness, Private Hospitals' normalized score was 1 followed by Private Teaching Hospitals with score 0.771. Public Teaching Hospitals and Public Hospitals followed. In the context of Empathy, Private Hospitals are given the highest priority for Empathy with 1 score, followed by Private Teaching Hospitals, Public Teaching Hospitals, and finally, Public Hospitals with scores 0.929, 0.48 and 0.29 respectively.

Table 7: Normalized Ranking of Hospitals

Combined Instance with respect to Goal	
Alternative	Priority
Private Teaching Hospitals	1
Public Teaching Hospitals	0.983
Private Hospitals	0.885
Public Hospitals	0.439

Private Teaching Hospitals having a score of 1, indicates that they are considered as the most favorable option according to the goal or criteria being evaluated in the AHP analysis. Public Teaching Hospitals have a score of 0.983 and is second preferred. Private Hospitals with a score of 0.885 and Public Hospitals have the lowest score of 0.439, suggesting they are the least preferred option among the choices evaluated respectively.

These ratings represent each type of hospital's relative value or attractiveness in the context of the AHP-analyzed decision-making process.

Sensitivity Analysis

Sensitivity analysis modifies the input data slightly to see how it affects the outcome. The results are deemed robust if the ranking remains constant. Using an interactive graphical interface is the most effective way to conduct the sensitivity analysis. It is seen that Tangibility holds the maximum priority followed by Reliability and Responsiveness.

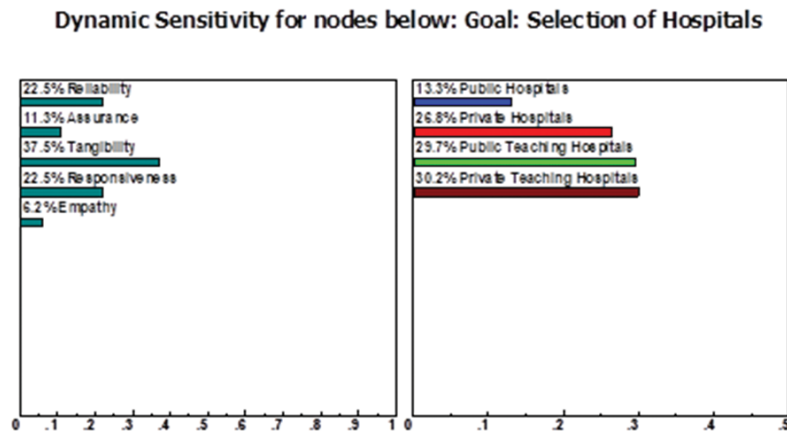


Figure 2: Ranking of Hospitals

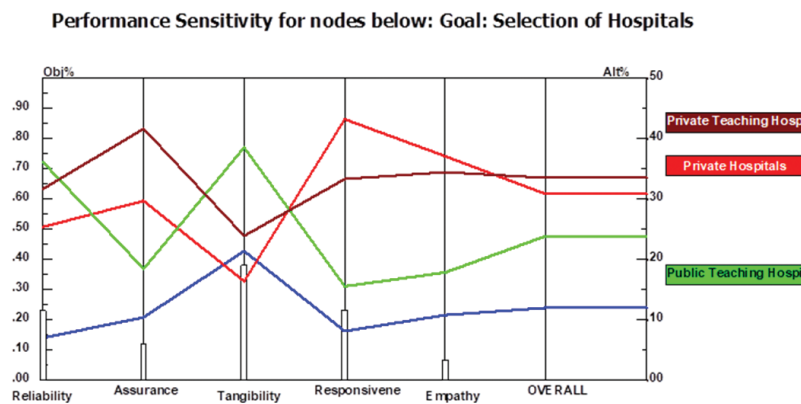


Figure 3: Sensitivity analysis with respect to empathy (upward change to 37%)

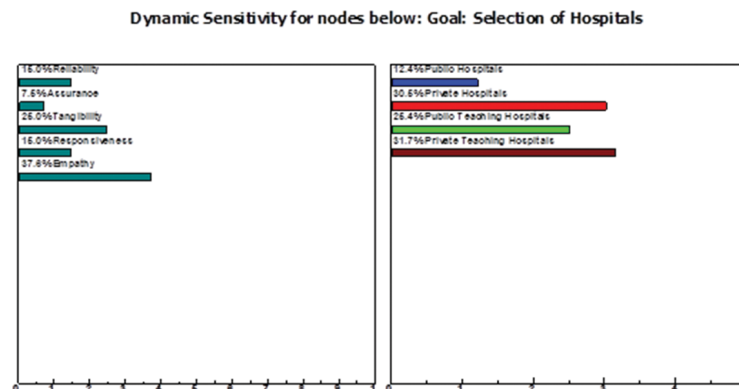


Figure 4: Sensitivity analysis with respect to Empathy

A sensitivity analysis was performed to check whether the rankings of the hospitals changed on changing the priorities of the criterias. The relative ranking can be improved if Empathy factor is improved as the sensitivity Analysis shows that the service quality of the hospitals is highly dependent on Tangibility. Only if empathy is prioritized, the rankings change.

Weighted head to head between Public Hospitals and Private Hospitals

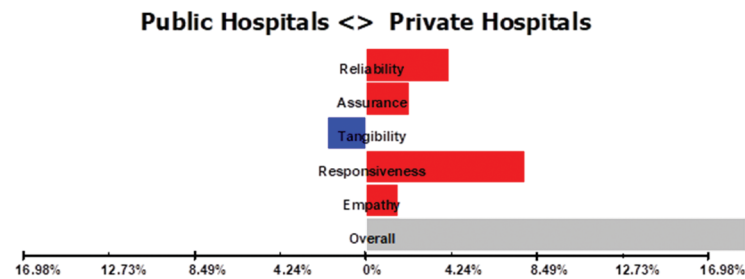


Figure 5: Comparison between Public Hospitals and Private Hospitals

The result of the study has shown that Private Hospitals are superior in four elements of service quality. However, Public Hospitals outperform private hospitals in terms of tangibles.

Weighted head to head between Public Hospitals and Public Teaching Hospitals

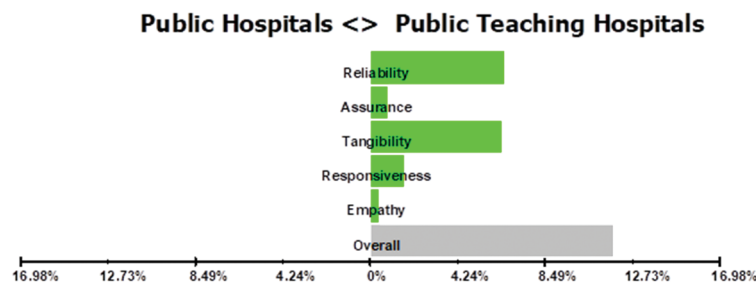


Figure 6: Comparison between Public Hospitals and Public Teaching Hospitals

The study found that in comparison, Public Teaching Hospitals outperformed Public Hospitals in all five parameters of Perceived Service Quality.

Weighted head to head between Public Hospitals and Private Teaching Hospitals

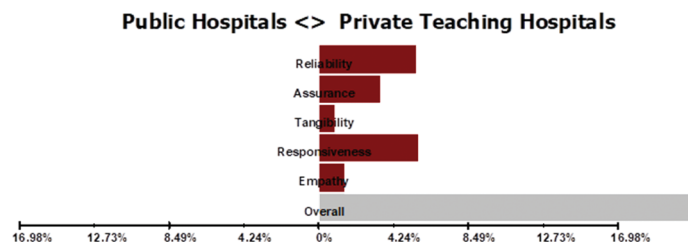


Figure 7: Comparison between Public Hospitals and Private Teaching Hospitals

The analysis shows that Private Teaching Hospitals are superior to Public Hospitals in each of the five

categories i.e. Reliability, assurance, tangibility, responsiveness, and empathy.

Conclusions and Recommendations

Conclusion and Recommendations for Future Research:

According to the results, private teaching hospitals are perceived to offer the best level of care and quality followed by public and private hospitals. Out of the four categories, public hospitals had the lowest ranking. Perceived service quality is superior at private teaching hospitals, suggesting a possible area of comparison and improvement for other healthcare providers.

Tangibles appeared as a significant element impacting perceived service quality, with empathy ranked as the least important dimension by patients. The findings emphasize the importance for healthcare managers to prioritize qualities such as responsiveness, tangibility, responsiveness, and assurance in order to improve service quality and meet consumer expectations. Tangibles, such as facilities and physical environments, have a significant impact on patients' perceptions of service quality, implying that expenditures in infrastructure and amenities may improve overall patient satisfaction. Furthermore, the focus on tangibles implies that improvements in facilities and physical infrastructure may raise overall patient satisfaction. The lower weight given to empathy suggests that there may be a deficiency in patient-centered care in Nepal's healthcare system, and that healthcare practitioners should give empathy and interpersonal communication top priority when providing care. The study proposes a hierarchical structure that hospital managers can use to rank the various factors/criteria that influence perceived service quality. Managers will be able to make better decisions by using the sensitivity analysis carried out in this study to examine the impact of varying the primary criteria's weights on hospital rankings. Managers can break down complex problems into simple hierarchies with the aid of this approach.

AHP is one of the most popular multicriteria decision-making analysis techniques in use today, if not the most (Essay, 2022). More research can be done using the method with various other main and sub criteria, as there is very little research in the literature currently available on service quality using AHP and expert choice. More research into the fundamental elements influencing how private teaching hospitals' services are perceived could shed light on their operational procedures and service delivery strategies. Healthcare managers may be able to improve staff empathy and patient engagement by customizing their training and development programs by investigating the reasons behind patients perceived lower value of empathy. Studies that monitor changes in the perceived quality of services over an extended period of time may be used to evaluate the efficacy of interventions meant to enhance service quality aspects and their influence on corporate performance. In order to meet patient expectations, rise patient satisfaction levels, and increase business performance, it is critical to comprehend and address various aspects of service quality in the Nepalese healthcare sector. The qualitative research, such as focus groups or interviews with patients and healthcare providers, could supplement the quantitative results and provide deeper insights into the subtleties of service quality perceptions and the underlying causes of the observed rankings.

Further investigation into the underlying factors contributing to the perceived service quality of private teaching hospitals could provide insights into their operational practices and service delivery models. Exploring the reasons behind the lower importance placed on empathy by patients could help healthcare managers tailor their training and development programs to enhance staff empathy and patient engagement. Longitudinal studies tracking changes in perceived service quality over time could assess the effectiveness of interventions aimed at improving service quality dimensions and their impact on business performance. Overall, this research underscores the importance of understanding and addressing dimensions of service quality in the Nepalese healthcare industry to meet customer expectations, enhance patient satisfaction, and ultimately improve business performance. Complementing the quantitative findings with qualitative investigations, such as interviews or focus groups with patients and healthcare professionals, could offer deeper insights into the nuances of service quality perceptions and the underlying reasons for the observed rankings.

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