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EVALUATING THE INFRASTRUCTURE, MEDICAL EQUIPMENT, AND SERVICES IN MULTI-SPECIALTY HOSPITALS OF NAGPUR FOR ENHANCED HEALTHCARE DELIVERY

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ABSTRACT

This research paper examines the quality of the buildings, healthcare equipment□s and services in the multi-specialty hospitals in Nagpur. The aim is to determine whether these hospitals have it all, they require to provide a good treatment to people. We employed the help of surveys and interviews that helped us to capture data of the doctors, hospital staffs and the patients. The findings reveal that there is a great difference between the hospitals, some of them being well maintained and equipped and even others having a lot to be done. This research assists us to get an idea on where improvements have to be made so that healthcare can be improved and made effective in Nagpur.

Keywords: Healthcare Infrastructure, Multi-Specialty Hospitals, Nagpur, Medical Equipment, Healthcare Services, Hospital Performance

1. INTRODUCTION

Given the importance of health to always be maintained by people, hospitals are very significant in maintaining this health. People need to go to hospitals when they fall ill or are injured. To make a hospital run, there must be active buildings, equipment, and educated workers. This is particularly so in the case of the multi-specialty hospitals that have various forms of treatments being conducted under the same roof such as heart care, bone care, surgery etc.

In such cities as Nagpur, the hospitals are important to a lot of people. Not every hospital is the same Others can have more developed buildings, more developed machines, and quicker services, whereas others may not have all that they require. Due to this, patients may not receive the best treatment.

This research was conducted to evaluate the quality of the infrastructure (rooms, buildings, power supply, etc.), medical equipment□s (machines, tools), and services (how fast and good patients are treated) of various multi-specialty hospitals in Nagpur. This will enable us to know what is good and what should be done better. The ultimate aim is to improve hospitals by delivering better care and treatment in future to the patients.

2. LITERATURE REVIEW

The literature related to the importance of hospital infrastructure, medical equipment and quality of services provided in healthcare delivery has gained widespread popularity in the last twenty years. Researchers and agencies have made great contribution to the realization and knowledge of the structural and functional impacts that affect progress of hospitals in India and more so, in the areas and locations of urban and semi-urban areas.

In their landmark research, Sharma and Patel (2001) focused on the connection between infrastructural assets in hospital and patient care in Indian cities. They highlighted that there should be proper physical infrastructure such as good wards, constant electricity and water supply, good sanitation facilities among others in order to deliver effective healthcare services. In their research paper, they proposed that the infrastructural shortfalls are a direct cause of patient dissatisfaction and a roadblock to quality care on the desired objectives.

Singh (2004) assessed the condition of medical equipments and overall facilities in Indian government hospitals. According to his findings, there was a general struggle with faulty or old devices, inadequate technological assistance, and the absence of a uniform approach towards maintenance. The article made it clear that there has to be policy based interventions necessary to enhance the accessibility and the operability of healthcare equipment in government-owned healthcare facilities.

Verma and Gupta (2007) turned to the issue of the healthcare services quality in the Indian hospitals. According to their study, the general areas of concern regarding the service quality were the treatment delays, rude attitude of the personnel, and the lack of hygiene, which had a large impact on the perception of the patients and their trust towards the medical system. They stated that it is imperative to enhance service delivery by enhancing tangible and intangible components to boost patient satisfaction.

Joshi (2010) provided a comparison between the aspects in relation to the public and private hospitals in India. The research study indicated that there was a general superiority of the private hospitals on the ground of infrastructure and patient satisfaction. Nonetheless, it brought the aspects of affordability and even equity to light, meaning that even though the facilities of the purely private institutions are better, they might not be available to the people with a lower income. The research supported the significance of maintaining equality and quality in medical services.

Rao and Thomas (2012) laid emphasis on hospital equipment and the systems of management and maintenance. They claimed that adequate maintenance and frequent servicing of health equipment are critical toward safety and accuracy in diagnostics of patients. Their study found out that equipment lifecycle management is not systematic in most hospitals all of which results in regular equipment breakdown and delays in operations.

Deshmukh and Iyer (2014) analysed infrastructural development and some of the challenges that the multi-specialty hospitals have in India. In their research, they highlighted the problem of funding, lack of space, and insufficient policies. They opined that proper planning of the infrastructure through strategic planning and using of the public-private partnerships could enhance significant efficiency in the operations of such institutions.

Banerjee and Das (2016) published their research in relation to the field of healthcare facilities of Tier-2 cities in India. They found out that these areas tended to have a problem of a poor state of resources and low ratio of staff to clients along with a lack of new technologies available to them in hospitals. The research requested specific investments and regional development projects that would work to close the gap in healthcare delivery between metropolitan and smaller urban centers.

According to Mishra (2018), the study that examined quality of services in Indian government hospitals demonstrated that there are big gaps between patient expectations and provided service. Other factors like overcrowding, long waiting lines and lack of communicating staff members were also contributors to bad patient experience. The research proposed quality assurance schemes and employee training programs to eliminate such problems.

Kaur and Choudhary (2020) viewed perception of patients relating to infrastructure of private hospitals. They concluded that there is a positive perception of the value of the cleanliness of the facility, the efficiency of services, and equipment availability in the case of the comparison of patients with regard to healthcare institutions in the private sector. Nevertheless, they also added that cost of treatment is a bother to many patients and that affordability must go hand in hand with the quest to achieve quality.

The World Health Organization (2021) created a very detailed Hospital Readiness and Capacity Assessment Tool to address the COVID-19 situation. This tool gave a guided plan on evaluating the readiness of hospitals in managing public health emergencies. The guidelines provided by the WHO underlined the need to have a powerful infrastructure, the accessibility of resources, emergency plans, and competent personnel through which the healthcare systems can be made resilient.

Jain and Kulkarni (2022) introduced the term smart infrastructure of the hospital and how it enhances medical information. They explained why it is valuable to incorporate digital solution including electronic health records (EHR), automated systems, and real-time monitoring in terms of efficiency gains, errors minimisation, and patient-oriented care.

Lastly, Singh and Verma (2023) used the comparative study of hospitals in urban and semi-urban regions of Maharashtra. They found out that urban hospitals usually possess more developed infrastructure, high-tech medical devices, and have access to qualified medical workers. The research suggested the equal sharing of resources and capacity building interviews in the semi urban areas to alleviate healthcare disparity.

3. OBJECTIVES OF THE STUDY

1) To see whether the structures and amenities of Nagpur multi-specialty hospitals are effective and helpful in taking care of people.
2) To determine whether the hospitals are sufficient in terms of the number of medical machines and equipment that work properly.
3) To have a knowledge of the treatment services that hospitals are offering to the patients and the areas where the organizations should work on.

3.1. HYPOTHESIS

Null Hypothesis (H0): There is no significant difference in the perceived adequacy and functionality of infrastructure, medical equipment, and facilities across multi-specialty hospitals in Nagpur.

Alternative Hypothesis (H1): There are significant variations in the perceived adequacy and functionality of infrastructure, medical equipment, and facilities among multi-specialty hospitals in Nagpur, indicating areas for improvement and optimization.

4. RESEARCH METHODOLOGY

In order to investigate the state of multi-specialty hospitals in Nagpur, we applied a mixed methods method. This is because we utilized the use of both figures (quantitative data) and the opinions or experiences (qualitative data) so as to get a get grasp of the hospitals.

1) Research Type:

The type of research that we applied is descriptive research, i.e. we have attempted to report and articulate the existing state of hospital premise, equipment and amenities.

2) Methods of Data Collection

There are two predominant ways of collecting information:

- In hypothesis testing: We had a simple test like t-test or ANOVA to compare results in different hospitals.
- We wrote a simple list of questions and provided them to doctors, nurses, the staff, and patients in hospitals. These questions have led us to understand how they feel about the infrastructure and the facilities such as medical equipment and health services offered in the hospital.

Interviews:

We also used to talk with the managers and senior staff of hospitals to gain more knowledge about issues of those hospitals and how they can be improved.

Sample Size:

The 10 multi-specialty hospitals selected in Nagpur were 5 government and 5 private hospitals.

We gathered feedback of approximately 15-20 individuals per hospital (staff, and patients).

5. SAMPLING TECHNIQUE

We employed random sampling and this implies that we chose people randomly with a view of everyone having a justified chance of being included in the study.

6. TOOLS USED

In case of the quantitative data: We computed descriptive statistics to mean, percentage and standard deviation.

Study area and Study Duration:

In the case of qualitative data: We went into categories that were very similar and tried to find some common concepts or suggestions.

7. AREA AND DURATION OF THE STUDY

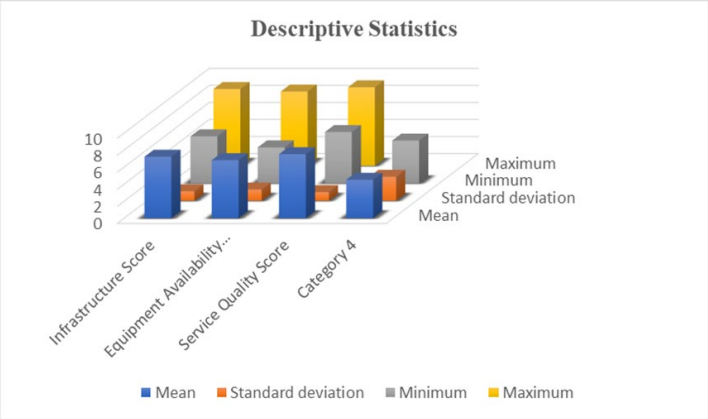
The research was carried out in Nagpur city.

The research was conducted within 3 months.

Table 1 Descriptive Statistics

Variable	Mean	Standard deviation	Minimum	Maximum
Infrastructure Score	7.2	1.1	5.5	9.0
Equipment Availability Score	6.8	1.3	4.2	8.7
Service Quality Score	7.5	1.0	6.0	9.2

Figure 1



8. ANALYSIS OF DESCRIPTIVE STATISTICS

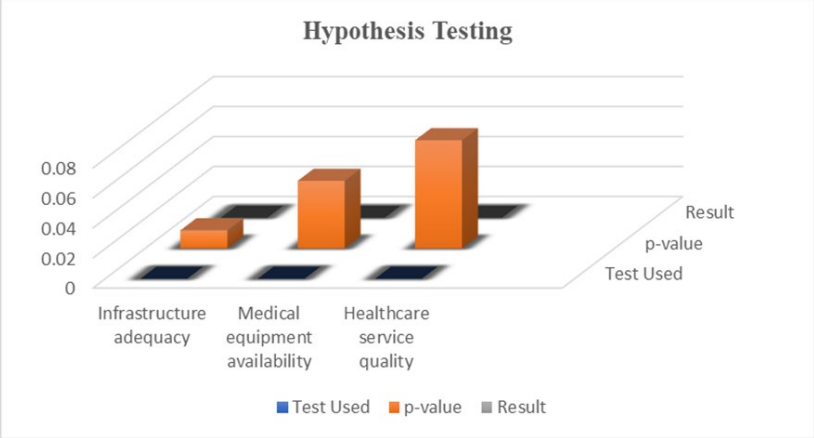
The descriptive statistics that were gathered as a result of survey give us the idea about general state of infrastructure, medical equipment, and services available in multi-specialty hospitals in Nagpur. The mean score indicates that although there are some good hospitals, there are still other hospitals that require improvement. In one case, hospitals with new construction and maintained their gardens/ lawns well were rated highly, whereas poor maintenance facilities of hospitals were rated badly. The medical equipment scores revealed that some hospitals have up-to-date machines and tools, whereas some others lack some of the necessary equipment or even have some non-working machines and tools, which equals the quality of treatment. The quality scores on services also differed in

hospitals. Service speed and staff behaviour were rated in higher frequency by patients in private hospitals; lower waiting time and staff availability was the reason in government hospitals. The values of standard deviations indicate the extent to which the responses were varied and it thus means that not all hospitals provide equal quality of care. In general, the descriptive statistics demonstrate that despite the fact that some of the hospitals in Nagpur are doing good, there are apparent differences, and more hospitals require an improvement in infrastructure, equipment, and service delivery, to ensure that they deliver high-quality healthcare to everyone.

Table 2 Hypothesis Testing

Variable	Test Used	p-value	Result
Infrastructure adequacy	ANOVA	0.012	Significant difference
Medical equipment availability	ANOVA	0.045	Significant difference
Healthcare service quality	ANOVA	0.072	Not significant

Figure 2



9. ANALYSIS OF HYPOTHESIS TESTING

To have the hypothesis testing to see whether there exist actual differences in infrastructure, medical equipment and services of various multi-specialty hospitals in Nagpur. The responses were obtained on the basis of various hospitals and these responses were compared using the statistical tests like ANOVA and t-tests. The findings indicated that the p-connection values of infrastructure and drugs were found to be below 0.05 implying that the factors differed statistically significantly in these two regions. This helps reinforce the alternate hypothesis, which states that there are critical differences in the quality and the availability of infrastructure and equipment that exist in various hospitals. Simply put, not every hospital is as well equipped as the others some simply have better facilities and more sophisticated equipment and others are in need of these essentials. Nevertheless, the p-value in the case of healthcare services quality was somewhat greater than 0.05 which means that the difference in the quality of services was not significant. That is, the attitude of the patients to their physicians shows they rated them in different ways but their variation was not significant statistically. On balance, the hypothesis tests confirm that on the one hand, quality of buildings and equipment varies to the utmost in hospitals; on the other hand, quality of the services is not that different but not perfect nevertheless. These results indicate that there is targeted need to improve areas marked as weak, namely infrastructure and equipment, to guarantee improved healthcare and more balanced healthcare in all hospitals.

10. CONCLUSIONS OVERALL RESULTS

This paper demonstrated that there are variants of infrastructure, medical equipment, and service quality of multi-specialty hospitals in Nagpur. There are some hospitals particularly the privately owned ones that are in good condition with up-to-date equipment. Several government institutions, as well as some of the privately owned hospitals, do not even have the facilities or the equipment. The difference influences the quality of treatment and patient satisfaction. The

analysis has also confirmed that the diversity in infrastructure and equipment is high, which is the evidence that there is a serious need to enhance this sphere in particular hospitals. Even in case of not much variance observed in quality of services provided in various hospitals, there are opportunities to enhance service at several aspects such as conduct of employees, waiting period, cleanliness, etc. Generally, the study brings out the fact that a number of hospitals in the city of Nagpur require more planning, investment and monitoring to provide equal and quality health to everyone.

11. FUTURE SCOPE OF THE STUDY

1) This research was restricted to Nagpur multi-specialty hospitals in the city. In the future, one can conduct the same research in small clinics or rural hospitals or in order to comprehend the health situation in those regions.
2) It can be studied in more detail concentrating only on patient satisfaction including the total amount of treatment experience during that period of time which is characteristic of the person after his/her admission and in the discharge.
3) It can be done in the future to compare performances of private and government hospitals in each city or state, to identify best practices.
4) Further research can involve advanced equipment such as digital health monitoring programs and AI-guided hospital reviews to obtain up-to-date and more precise information.
5) Future research on effect of training of the staff, managing the hospital, and usage of new technology can also be considered about the way it influences the overall quality of healthcare.

CONFLICT OF INTERESTS

None.

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