Quality Assurance in Thumbay Dental Hospital: A statistical analysis of patient satisfaction survey data using control charts.

Dissertation Submitted to

The IIHMR University, Jaipur, India

for the partial fulfillment of the award of the degree of

Master of Business Administration (MBA)

In

Hospital and Health Management/Pharmaceutical Management/Development Management

By

Dr. Pratyay Banerjee

Under the supervision and guidance of

Dr. Mahendra Kumar

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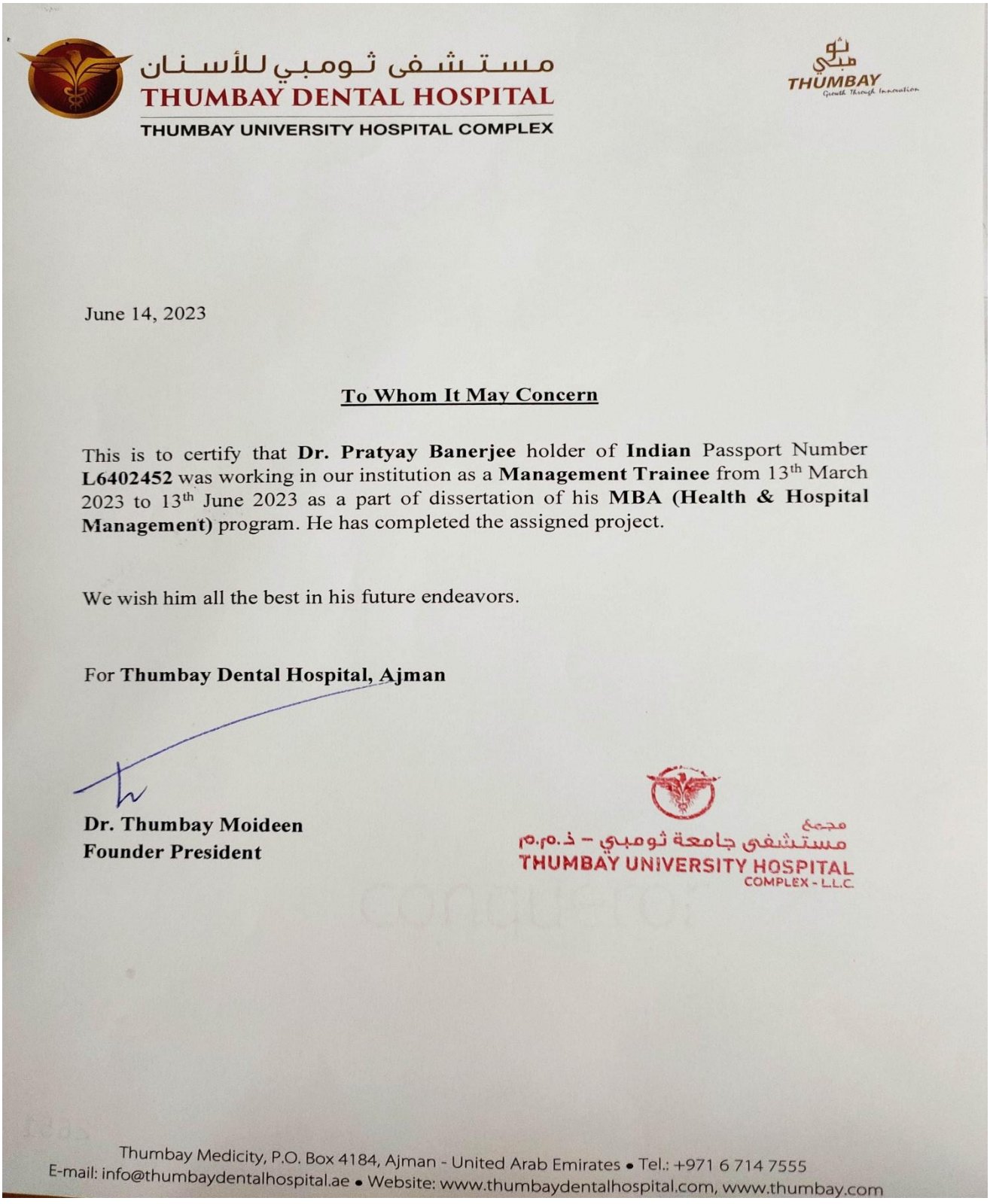
Declaration by student

'I hereby declare that this dissertation titled **Quality Assurance in Thumbay Dental Hospital: A statistical analysis of patient satisfaction survey data using control charts** is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.'

Dr. Pratyay Banerjee
16-6-2023

Certificate of completion:



مستشفى ثومبي للأسنان
THUMBAY DENTAL HOSPITAL
THUMBAY UNIVERSITY HOSPITAL COMPLEX

ثومبي
THUMBAY
Growth Through Innovation

June 14, 2023

To Whom It May Concern

This is to certify that **Dr. Pratyay Banerjee** holder of **Indian** Passport Number **L6402452** was working in our institution as a **Management Trainee** from 13th March 2023 to 13th June 2023 as a part of dissertation of his **MBA (Health & Hospital Management)** program. He has completed the assigned project.

We wish him all the best in his future endeavors.

For **Thumbay Dental Hospital, Ajman**

Dr. Thumbay Moideen
Founder President

مجمع
مستشفى جامعة ثومبي - ذ.م.م
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Abstract:

To estimate the quality-of-service patient satisfaction survey is done at the The Thumbay Dental Hospital, Ajman, UAE. The deficiency of service quality is due to process deficiency. Statistical control charts are great tools for detection of out-of-control processes. Statistical control charts can be implemented in the patient satisfaction survey data. They depict the overall picture of negative responses in graphical template. These negative responses can be investigated to detect process failures. The statistical control charts act as a filter to select those failed processes with detrimental outcomes from failed processes with less negative outcomes. The statistical control charts can be implemented in dental hospital to improve service quality and well as patient satisfaction. Twelve questions are used for the survey. The total number of respondents is four hundred and sixteen. The results are plotted in Statistical control charts of type p-chart and u-chart. Some out-of-control responses are detected in front desk service, nursing services biomedical services and pricing of treatment costs. Investigation is done for the root cause of problems. Recommendations like human resource training and upgrade, regular scheduled maintenance of equipment and expansion of health insurance network are provided for the quality improvement.

Keywords: Patient satisfaction survey, Statistical Control charts, Shewhart control charts, Dental Hospital Quality Assurance, Dental hospital Operations.

Acknowledgement:

I would like to take this opportunity to express my gratitude to all those who helped me complete my dissertation internship at Thumbay Dental Hospital, Ajman, UAE. I would also like to acknowledge my heartiest thanks to Thumbay Dental Hospital for providing me with the exposure during internship tenure. I am extending my gratitude to Dr. Mahender Kumar, my mentor and guided me and helped me with useful suggestions for completing my project.

I would also like to express my gratitude for Dr. Danavanthi Bangera (Medical Director at Thumbay Dental Hospital, Ajman) for supporting me at various stages of my project and having faith in me.

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Dr. Pratyay Banerjee

IIHMR-U/01/2021-2023/1352

IIHMR University, Jaipur, India

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Abbreviations:

Pedodontist- A specialist dentist who specializes in treatment of children.

1. Introduction:

Patient Satisfaction Survey Data:

In the modern healthcare environment, patient satisfaction is a fundamental measure of the quality of care. It is pivotal for healthcare providers, including dental hospitals, to regularly assess patient satisfaction to ensure the delivery of high-quality services(1). Patient satisfaction surveys are structured questionnaires that gauge the patients' perceptions and experiences regarding the care they received. In a dental hospital, such surveys might include questions on various aspects of the service, such as the courtesy of the staff, cleanliness of the facility, waiting times, and the perceived competence of the healthcare professionals. Collecting survey data is essential, as it provides an insight into what the patients value the most, and which aspects need improvement.

Quality Assurance in Dental Hospital:

Patient satisfaction survey and feedback data play a critical role in quality assurance in a dental hospital. Quality assurance refers to the systematic process of checking whether the processes or services meet or exceed the expected standards. In a dental hospital, this encompasses not only the clinical outcomes but also the overall experience that patients have. Utilizing patient feedback data allows dental hospitals to identify areas where they excel and areas requiring improvement. A positive patient experience is not just about satisfaction; it is intricately linked to better adherence to medical advice, lower rates of complications, and an increased likelihood of patients returning for follow-up care. The continual evaluation and improvement of service quality, informed by patient feedback, contributes to excellence in patient care and the reputation of the dental hospital. A negative patient experience means there are bottle necks in processes which should be removed.

Statistical Control Charts:

Statistical control charts are a powerful tool in quality assurance. They are graphical representations that show how a process changes over time. The main components of a control chart include a centerline, upper, and lower control limits that define the range of acceptable variation.(2)

The various types of statistical control charts include:

Table 1

Chart Name	Probability Distribution	Applications	Use Cases
P Chart	Binomial	Monitoring the proportion of non-conforming items in a sample	Monitoring the proportion of patients who acquired an infection post-surgery each month
U Chart	Poisson	Monitoring the number of non-conformities per item, for varying sample sizes	Monitoring the number of medication errors per number of prescriptions filled
C Chart	Poisson	Monitoring the number of nonconformities in an item	Monitoring the number of patient complaints regarding staff behavior per month
I-MR Chart	Normal	Monitoring individual measurements taken sequentially	Monitoring the wait time of individual patients in the ER
X-bar S Chart	Normal	Monitoring mean and standard deviation of subgroups of data	Monitoring average lab test turnaround times each day and their consistency
X-bar R Chart	Normal	Monitoring mean and range of subgroups of data	Monitoring average patient satisfaction scores across different departments each week
NP Chart	Binomial	Monitoring the ‘number of non-conforming’ items in a sample	Monitoring the number of medication errors each day in a pharmacy department

Using Control Charts in Patient Feedback Data Analysis:

Statistical control charts can be invaluable in analyzing patient survey data over time. By plotting survey responses on control charts, dental hospitals can monitor trends and detect changes in patient satisfaction. (3)

Specifically, attribute control charts like P or U charts can be used when dealing with categorical data such as patient satisfaction survey responses. These charts can help monitor the proportion or rate of unsatisfactory responses over time. While Likert scale data is ordinal, it is sometimes treated as continuous for the purpose of control charts, although this approach has limitations.

For dental hospitals, employing control charts as part of quality assurance ensures that the services are constantly monitored. When changes are implemented, their effect on patient satisfaction can be tracked. This continuous cycle of monitoring, implementing changes, and assessing their effect helps to foster an environment of continuous improvement, which is at the heart of quality assurance.

By making patient feedback data analysis an integral part of the quality assurance process, dental hospitals can achieve a patient-centric approach. This leads not only to higher satisfaction levels but also to better clinical outcomes. Ultimately, this dedication to quality assurance establishes the hospital as a trustworthy institution that consistently delivers exceptional dental care.

Thumbay Dental Hospital, Ajman, UAE is continuously striving to improve patient outcomes and satisfaction while maintaining cost-effectiveness and efficiency. The hospital follows Joint Commission International Standards for Ambulatory Care 4th Edition(4) standards and is also accredited by it. In March 2023 it received the JCI Enterprise Accreditation from Joint Commission International. Also, it has been accredited by the Australian Dental Council in 2023. It has commercial as well as the Academic departments and clinics. The academic outpatient department provide low-cost treatment to patients while the commercial outpatient department provide treatments at competitive market rates. Patient satisfaction surveys provide valuable window on patients' experiences and perceptions of the care they receive. Statistical control charts, a powerful tool in statistical process control, can be employed to analyze and monitor these data sources to identify trends, variations, and areas for improvement. This dissertation

aims to explore the application of statistical control charts in analyzing patient satisfaction survey data to enhance healthcare quality and patient satisfaction.

Objective:

1. To review the literature on the implementation of statistical control charts in hospital settings, focusing on their application in analyzing patient satisfaction survey data.
2. To develop a methodology for applying statistical control charts to patient satisfaction survey data including data collection, preprocessing, and analysis.
3. To apply the developed methodology to a real-world dataset of patient satisfaction survey data and identifying trends, variations, and areas for improvement.
4. To evaluate the effectiveness of the proposed methodology in identifying actionable insights for enhancing healthcare quality and patient satisfaction.(5)
5. To provide recommendations for dental treatment providers and hospital policymakers on how to utilize statistical control charts to monitor and improve healthcare quality and patient satisfaction.

2. Review of literature

Table 2

Sr No.	Authors (year)	Study Location	Sample size	Sampling Technique	Salient Features
1.	Dena A Ali (2019)(6)	Kaifan Kuwait	497	Stratified Random Sampling	Causal Relationship established between satisfaction and sociodemographic characteristics.
2.	Susan Robinson (2014)(7)	South Carolina, USA	13000	Convenient Sampling	Use Of C chart and U chart in monitoring hospital safety climate.
3.	Nayara Nicole de Sene Pereira, Evandro Eduardo Broday (2020)(8)	Brazil	60	Convenient Sampling	Moving range chart, Individual measurement charts employed to monitor the waiting time at the basic healthcare unit in Brazil.
4.	Serkan Altuntas, Turkay Dereli & İhsan Kaya (2018)(9)	Istanbul, Turkey	618	Random Sampling	Servqual Model Used. Patient dissatisfaction plotted with statistical control charts. Determine the level of dissatisfaction in hospital services.
5.	Fuad Hussain Akbar,	Makassar, Indonesia	94	Convenience Sampling	Patient satisfaction in dental hospital.

	Burhanuddin Pasiga (2017)(10)				Percentage scores were used to measure the level of satisfaction.
6.	Budi Priyono (2021)(11)	Surabaya, Indonesia	283	Probability Sampling	The study aims to find the magnitude of patient satisfaction about the types of services provided in a dental hospital
7.	Mohammed Mahmoud Al-Momani (2015)(12)	Riyadh, Kingdom of Saudi Arabia	432	Convenience Sampling	Servqual scale was adopted. Focussed on nursing care. Analysed the Gap between patient expectations as opposed to perception.
8.	Shu-Ju, Hsiu-O Kao, Bao-Lin Chang, Shu-Ing Gong, Shu-Mei Liu, Shih-Chi Ku, Jih-Shuin Jerng (2020)(13)	Taiwan	117	Convenience Sampling	Determining the service quality in Intensive Care units Analyse the Gap between expectations and perceptions. Used Servqual approach.
9.	Aspasia Goula , Maria-Aggeliki Stamouli , Maria Alexandridou , Lemonia Vorreakou , Aristeidis Galanakis , Georgios Theodorou , Emmanouil Stauropoulos ,	Greece	700	Convenience	Gap analysis between patient perception and expectations. Servqual model used

	Martha Kelesi and Evridiki Kaba (2021)(14)				
10.	*AÖ Porsuk, Ç Cerit* (2023)	Turkey	432	Random Sampling	Servqual Model Used to determine patient satisfaction in Healthy Life Centers in Turkey
11.	Dwi Prijatmoko, Elyda AA. Misrohmasari, Windy N. Eriyati (2020)(1)	Jember, Indonasia	100	Purposive sampling	Patient satisfaction index used to measure satisfaction in dental hospital

3. Methodology:

3.1 Research Question:

How can statistical control charts be applied to analyze patient satisfaction survey data to identify trends, variations, and areas for improvement in healthcare quality and patient satisfaction?(9)

3.2 Study design:

A Descriptive study design is used to collect patient satisfaction survey data, and retrospective patient satisfaction data is collected from Hospital Information Management System based on specific parameter checklists.

3.3 Study Setting:

The study is conducted at Thumbay Dental Hospital, Ajman, UAE. The hospital operates from 9am to 9pm for seven days a week. The hospital provides Dental Consultation, Dental Extraction, Root Canal Treatment, Orthodontic Treatments, Dental Implantation, Oral rehabilitation, and Prosthesis. The study is conducted during office hours of 8:30 am to 5:30 pm on all days except Sundays and other regional holidays.

3.4 Study population:

All consenting patients who have undergone treatment in the dental hospital for the patient satisfaction survey.

i. Inclusion Criteria:

All patients registered with the Thumbay Dental Hospital.

ii. Exclusion Criteria:

Patient referred from Thumbay Hospital, Ajman.

3.5 Sample Size:

To determine the sample size Cochran's formula is used.

$$n = \frac{Z^2 \cdot p \cdot q}{E^2}$$

Equation 1

n represents the required sample size.

Z is the z-score corresponding to the desired level of confidence. For example, for a 95 percent confidence level, the z-score would be approximately 1.96.

p is the estimated proportion of the population.

q is the complementary probability of p, which is equal to 1−p.

E is the margin of error (the maximum acceptable difference between the sample estimate and the true population proportion).

For the study confidence interval is taken as 95 percent. Hence the corresponding z-score will be 1.96.

For the study estimated proportion that is p is taken as 50 percent. Hence, complementary probability that is q is also 50 percent.

For the study margin of error that is E is taken as 5 percent.

The estimated sample size came to be 384.

But data is collected for 416 samples. Hence it overcome the sample size requirements.(15)

3.6 Sampling technique:

Convenience sampling is used for this study.

3.7 Data Collection procedure:

Patient satisfaction survey primary data is collected using a standardized survey tool already being used in the organization. Paper forms were used for the participants to fill in the details and questionnaire for the months of March 2023 and April 2023. But for the month of May 2023 Google form is created utilizing the same questionnaires and displayed at the front desks in the Hospital. Previous months data that is from February 2022 to February 2023 is collected from the Hospital Management Information System.

3.8 Operational Definition:

Patient satisfaction is defined as the degree to which patients are satisfied with the care they receive from the hospital.

Non-conformities- Here it means the responses having ‘poor’ and ‘very poor’ cumulative count. The count of ‘poor’ and ‘very poor’ is obtained from the questionnaire response.

3.9 Data analysis plan:

The patient satisfaction survey data is analyzed using statistical control charts in Microsoft Excel. Reliability and Correlation statistics is done with SPSS. The control charts is used to identify areas of improvement in healthcare services based on the analysis of the data.(16)

3.10 Ethical considerations:

This study adheres to ethical guidelines outlined by the IIHMR University Review Board. Only consenting patients participated in the study. The confidentiality of the participants is maintained throughout the study.

4. Results:

In this section of the study report, the results are discussed.

Out of the total four hundred and sixteen respondents the demographic data is available for only three hundred and forty-three respondents.

4.1 Gender Distribution:

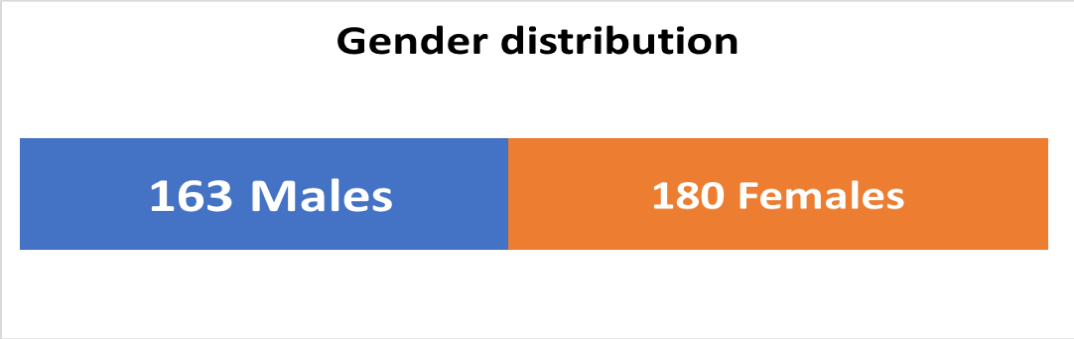

Figure 1

Out of three hundred and forty-three respondents one hundred and eighty are females and one hundred and sixty-three are males.

4.2 Age Distribution of the respondents:

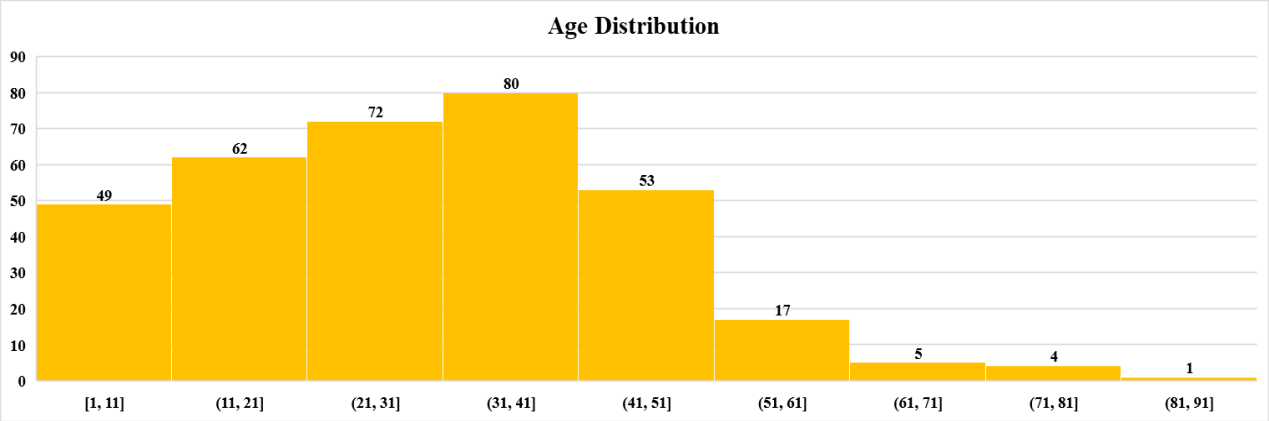

Figure 2

Out of three hundred and forty three respondents forty nine are in the age group of one to eleven, sixty two are in the age group of eleven to twenty one, seventy two are in the age group of twenty one to thirty one, eighty are in the age group of thirty one to forty one, fifty three are in the age group of forty one to fifty one, seventeen are in the age group of fifty one to sixty one, five are in the age group of sixty one to seventy one, four are in the age group of seventy one to eighty one, and one in the age group eighty one to ninety one.

4.3 Geographic Distribution of the patients:

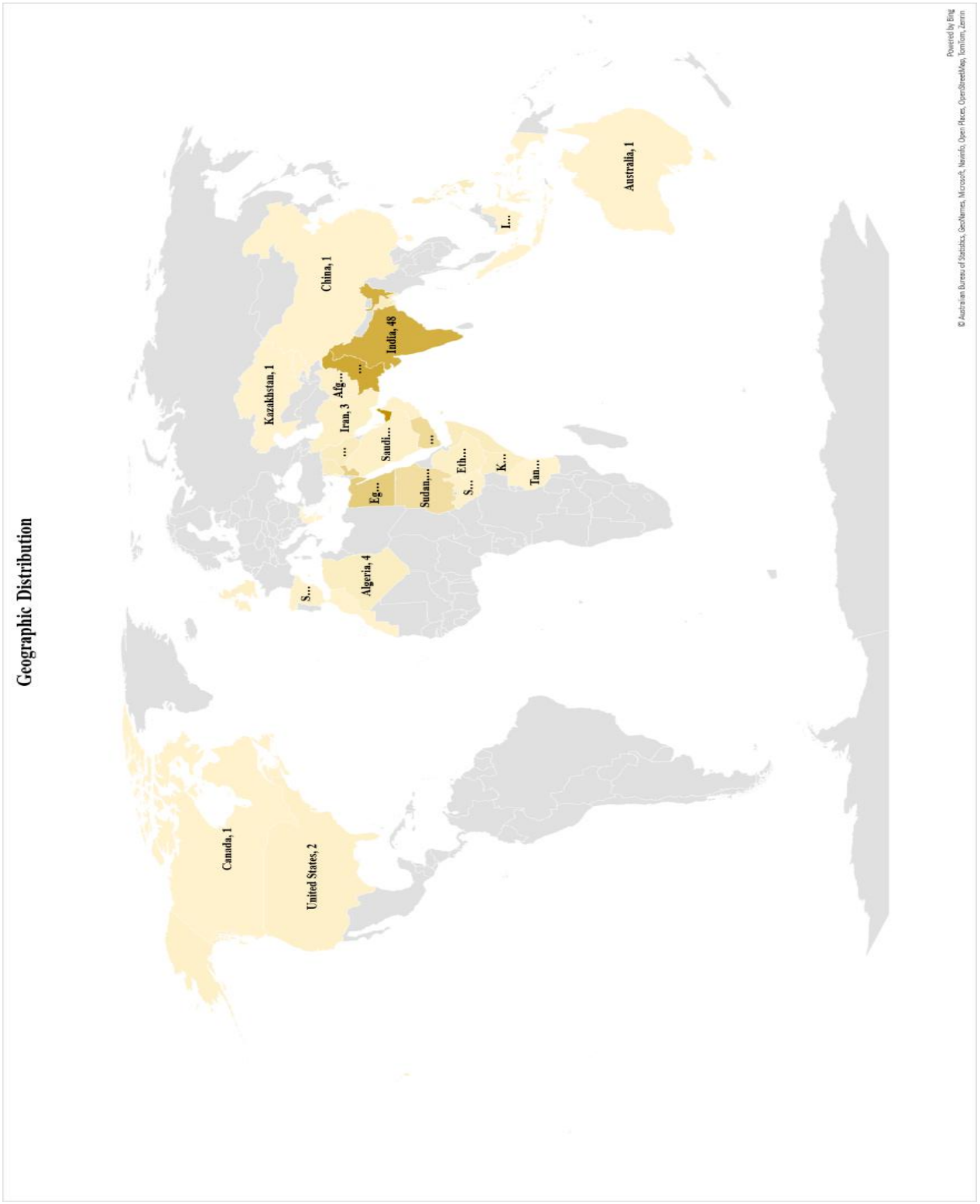

Figure 3

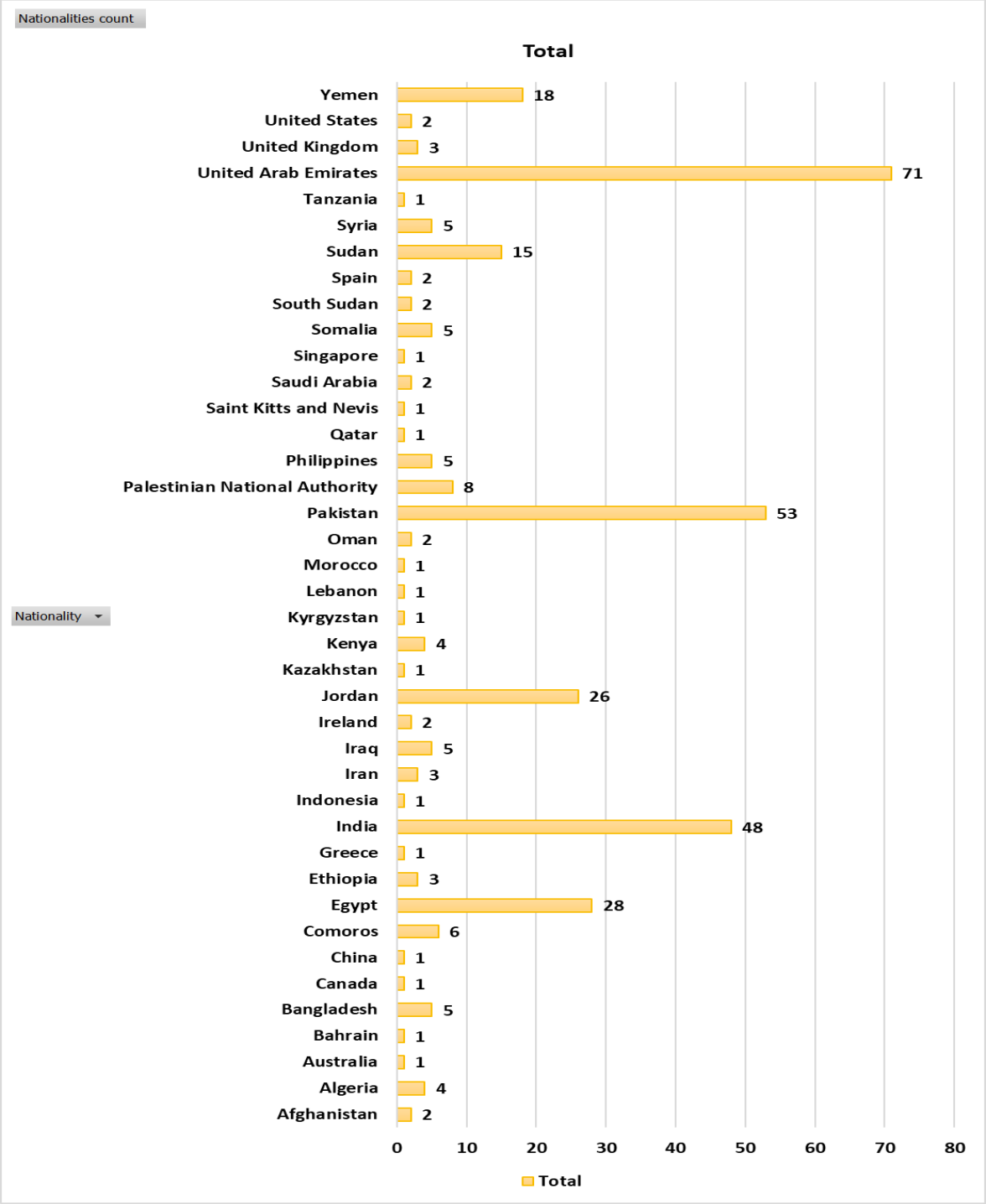

Figure 4

From the Figure it can be inferred that most of the patient respondents are from United Arab Emirate nationality followed by Pakistan, India, Egypt, Jordan and so on.

Internal consistency and reliability of the respondents data is checked for internal consistency by measuring the Cronbach's Alpha.

Reliability Statistics

Cronbach's Alpha	N of Items
.939	12

Figure 5

Figure 5 shows that Cronbach's Alpha is nearer to one. Hence data is highly reliable and has internal consistency.

Strength of association between two variables is measured using Correlation statistics.

Correlations

		Front Desk Ability	Front Desk Courtesy	Front Desk speed of service	Doctor Treatment	Doc Courtesy	Nurse Behaviour	Nurse Experience during procedure	Nursing Courtesy	Cleanliness and Hygiene	FACILITY Experience	Price	Time and Quality of service	Total_c
Front Desk Ability	Pearson Correlation	1	.834**	.813**	.628**	.649**	.609**	.591**	.661**	.513**	.660**	.353**	.651**	.829**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Front Desk Courtesy	Pearson Correlation	.834**	1	.876**	.543**	.606**	.665**	.587**	.627**	.511**	.610**	.308**	.642**	.817**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Front Desk speed of service	Pearson Correlation	.813**	.876**	1	.567**	.595**	.661**	.625**	.631**	.482**	.596**	.365**	.659**	.825**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Doctor Treatment	Pearson Correlation	.628**	.543**	.567**	1	.883**	.574**	.544**	.609**	.536**	.628**	.385**	.600**	.774**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Doc Courtesy	Pearson Correlation	.649**	.606**	.595**	.883**	1	.609**	.602**	.602**	.602**	.663**	.355**	.635**	.801**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Nurse Behaviour	Pearson Correlation	.609**	.665**	.661**	.574**	.609**	1	.835**	.749**	.638**	.682**	.372**	.681**	.831**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
	N	415	415	415	415	415	415	415	415	415	415	415	415	415
Nurse Experience during procedure	Pearson Correlation	.591**	.587**	.625**	.544**	.602**	.835**	1	.816**	.657**	.638**	.402**	.716**	.826**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Nursing Courtesy	Pearson Correlation	.661**	.627**	.631**	.609**	.602**	.749**	.816**	1	.680**	.757**	.438**	.777**	.862**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Cleanliness and Hygiene	Pearson Correlation	.513**	.511**	.482**	.536**	.602**	.638**	.657**	.680**	1	.739**	.376**	.629**	.745**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
FACILITY Experience	Pearson Correlation	.660**	.610**	.596**	.628**	.663**	.682**	.638**	.757**	.739**	1	.487**	.667**	.835**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Price	Pearson Correlation	.353**	.308**	.365**	.385**	.355**	.372**	.402**	.438**	.376**	.487**	1	.496**	.597**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Time and Quality of service	Pearson Correlation	.651**	.642**	.659**	.600**	.635**	.681**	.716**	.777**	.629**	.667**	.496**	1	.853**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000
	N	416	416	416	416	416	415	416	416	416	416	416	416	415
Total_c	Pearson Correlation	.829**	.817**	.825**	.774**	.801**	.831**	.826**	.862**	.745**	.835**	.597**	.853**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	
	N	415	415	415	415	415	415	415	415	415	415	415	415	415

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 6

The figure 6 shows that the question variables are highly associated with each other as all the Pearson correlation values are nearer to one.

For calculation of statistical control charts the responses count of ‘very poor’ and ‘poor’ are calculated for each month as well as for each question. Summation is done for the count to represent the non-conformities in the Likert scale data.

The p type statistical control chart is applied to each question of the questionnaire and the proportion of non-conformity is plotted for each month.

The p-chart, or proportion chart, is used to track the proportion of non-conformities in a sample, where the sample size can vary. It can be used to keep track of non-conformity over time.

It is used in the study to determine those process non-conformities that are outside control and implement corrective actions to reduce them.

Mean is the average amount of variations in the data.

Here upper limit of three standard deviations and lower limit of three standard deviations highe and lower from the mean are taken as the upper control limit and the lower control limit respectively. So those data points which are within the two control limits are taken as within control. Those data points which are beyond the two control limits are taken as out of control processes and those need to be investigated.

The formula for the proportion of nonconformities (p) is:

$$\mathrm{p} = \frac{\sum \mathrm{x}}{\sum \mathrm{n}}$$

Equation 2

Where:

$p =$ proportion of nonconforming units

$x =$ number of nonconforming units in the sample

$n =$ size of the sample

$$UCL = p + 3\sqrt{\frac{p(1-p)}{n}}$$

Equation 3

$$LCL = p - 3\sqrt{\frac{p(1-p)}{n}}$$

Equation 4

Where:

$UCL =$ Upper Control Limit

$LCL =$ Lower Control Limit

In the analysis the Lower Control Limit is set to 'Zero' because proportion cannot be negative.

In the graphical presentation of data, P represents the mean, proportions represent each data point.

Upper cl represents upper control limit.

Lower cl represents lower control limit.

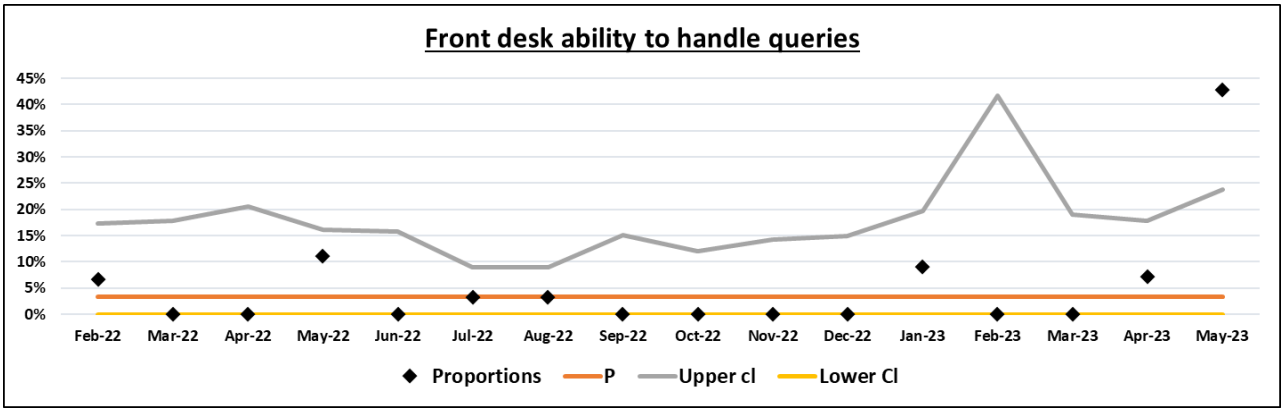

Figure 7

In figure 7 above the response nonconformities for front desk ability to handle queries are within control for the months of February 2022 till April 2023. But it got out of control during the month of May 2023.

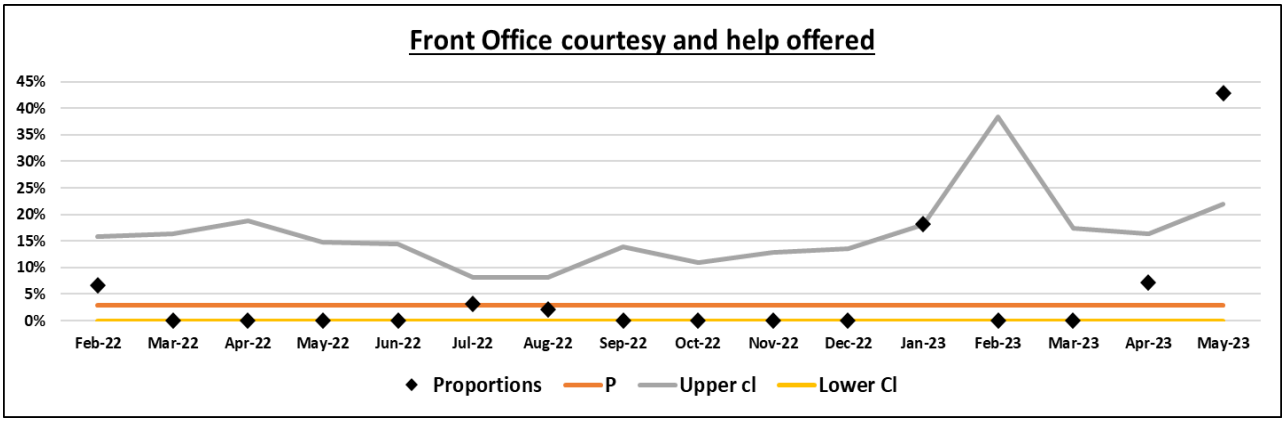

Figure 8

In figure 8 above the response nonconformities for front office courtesy and help offered are within control for the months of February 2022 till April 2023. Although for the month of January 2023 it is on the border of upper control limit. But it got out of control during the month of May 2023.

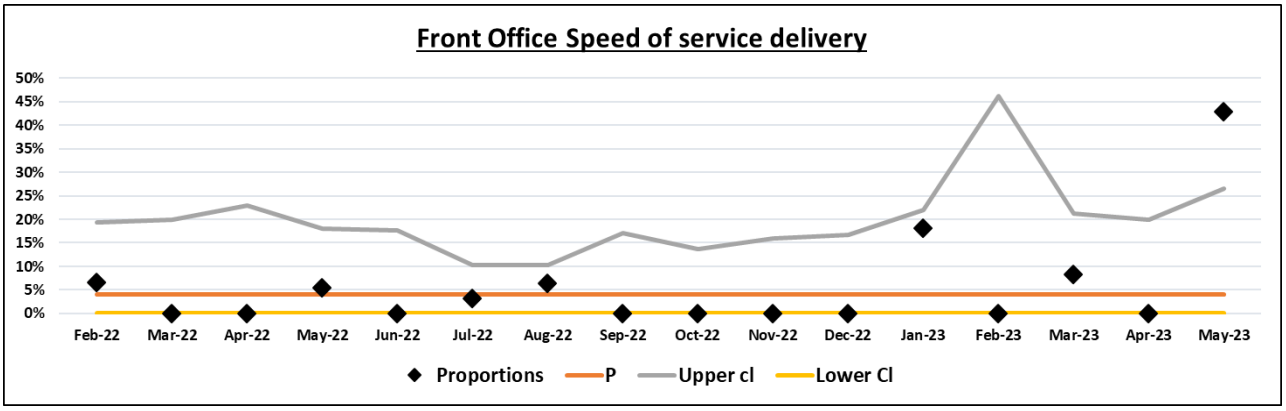

Figure 9

In figure 9 above the response nonconformities for front office speed of service delivery are within control for the months of February 2022 till April 2023. Although for the month of January 2023 it is near the border of upper control limit. But it got out of control during the month of May 2023.

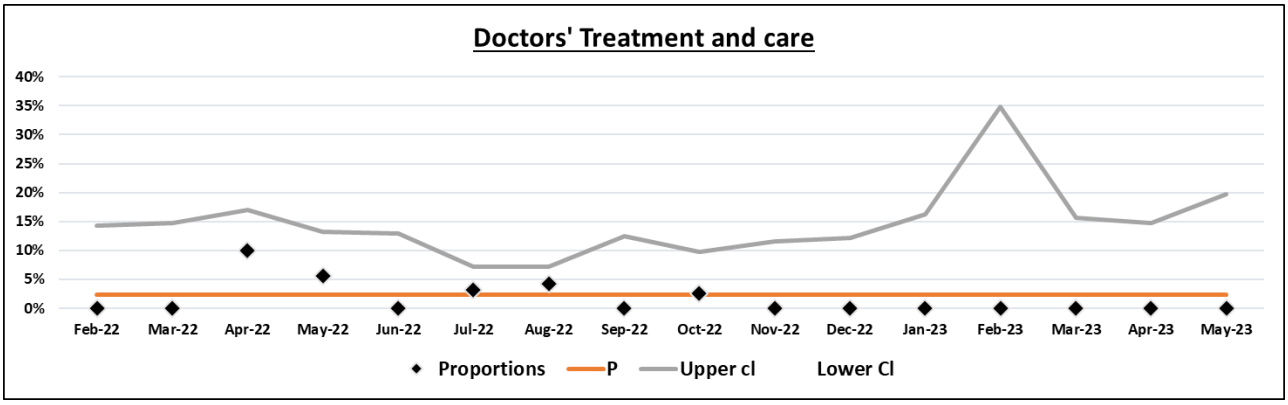

Figure 10

In figure 10 above the response non-conformities for the process of doctors' treatment and care are within control for the months of February 2022 till May 2023.

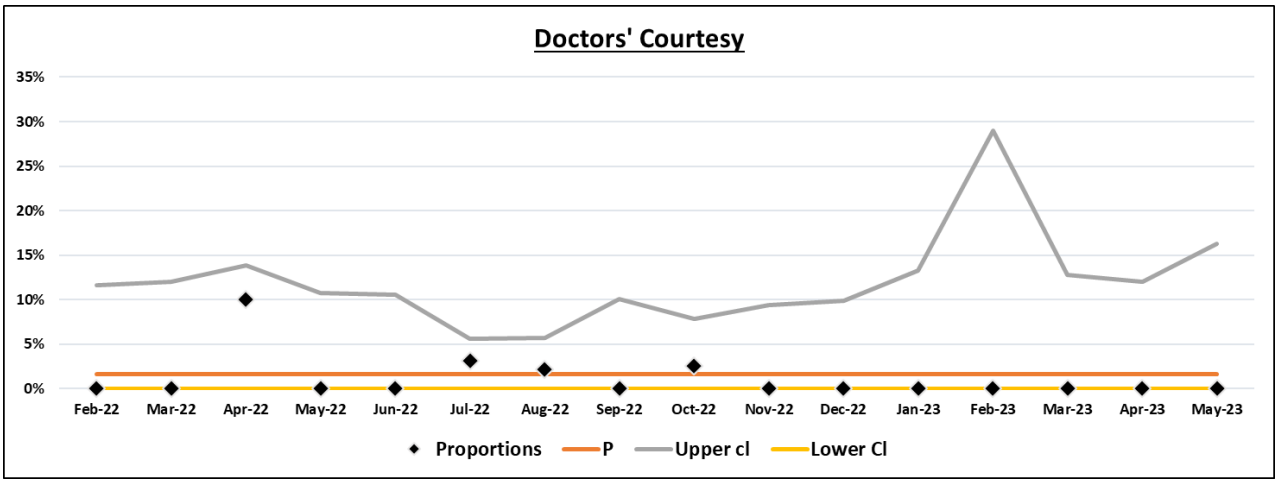

Figure 11

In figure 11 above the response non-conformities for the process of doctors' courtesy are within control for the months of February 2022 till May 2023.

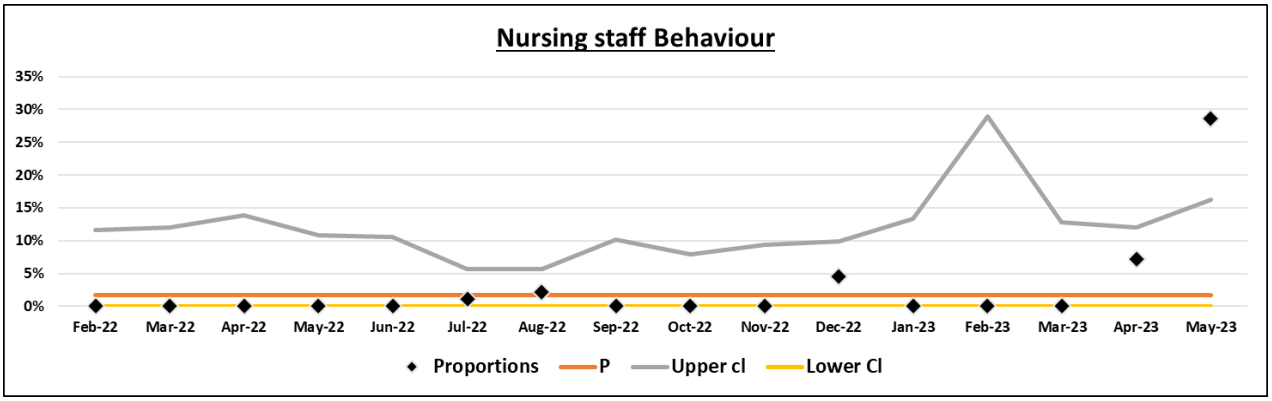

Figure 12

In figure 12 above the response non-conformities for Nursing staff behavior are within control for the months of February 2022 till April 2023. Although for the month of April 2023 it is high but within the control limit. But it got out of control during the month of May 2023.

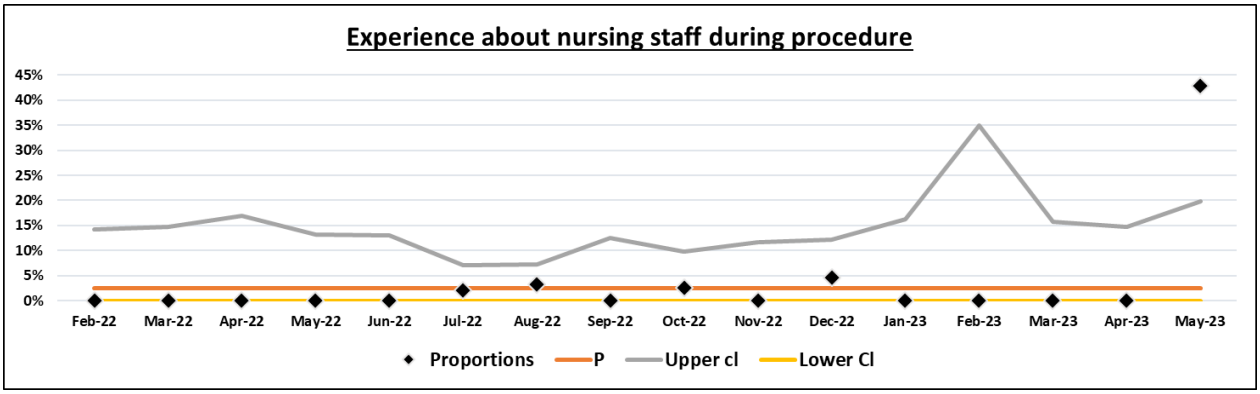

Figure 13

In figure 13 above the response nonconformities for Experience about nursing staff during procedure are within control for the months of February 2022 till April 2023. But it got out of control during the month of May 2023.

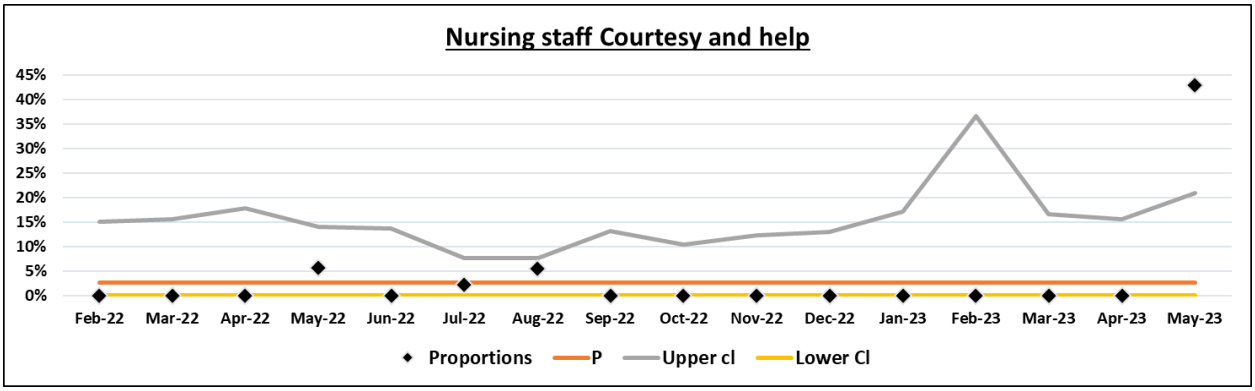

Figure 14

In figure 14 above the response nonconformities for Nursing staff behavior are within control for the months of February 2022 till April 2023. Although for the month of April 2023 it is high but within the control limit. But it got out of control during the month of May 2023.

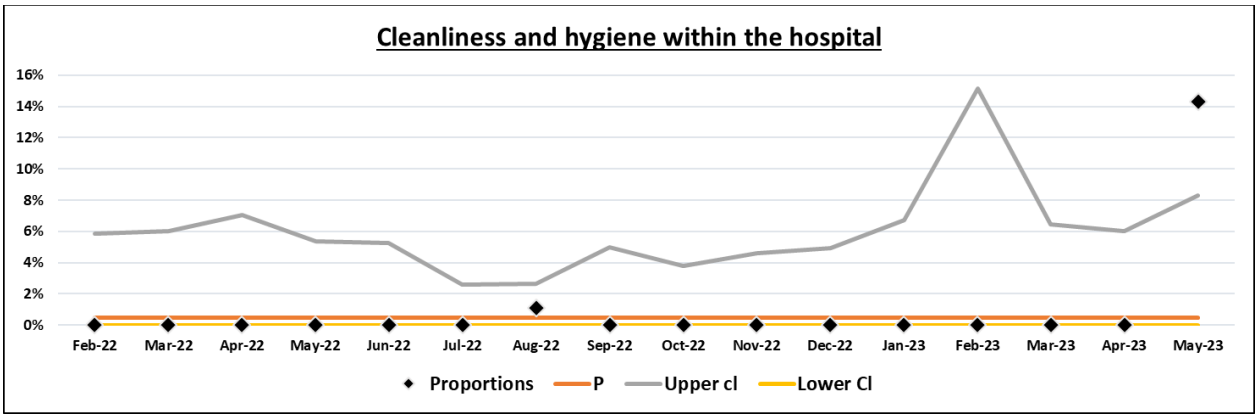

Figure 15

In figure 15 above the response nonconformities for Cleanliness and hygiene within the hospital are within control for the months of February 2022 till April 2023. But it got out of control during the month of May 2023.

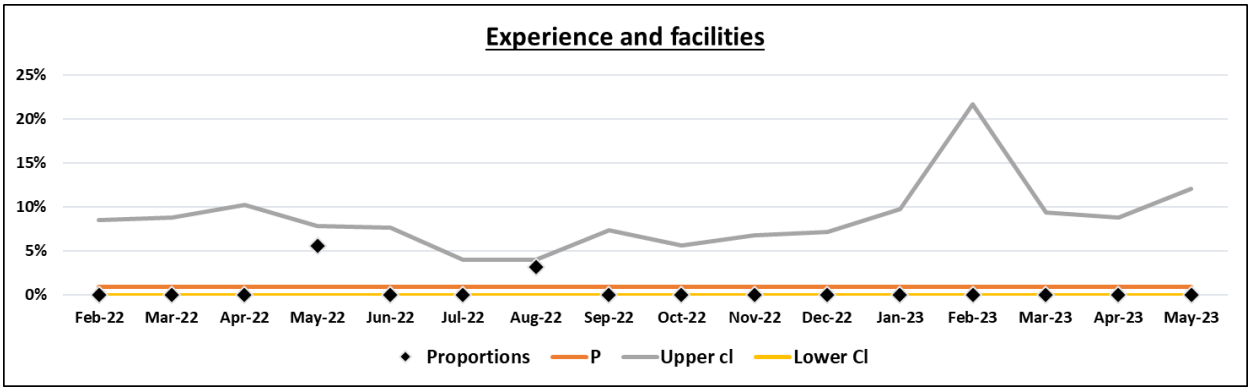

Figure 16

In figure 16 above the response nonconformities for experience and facility within the hospital are within control for the months of February 2022 till May 2023.

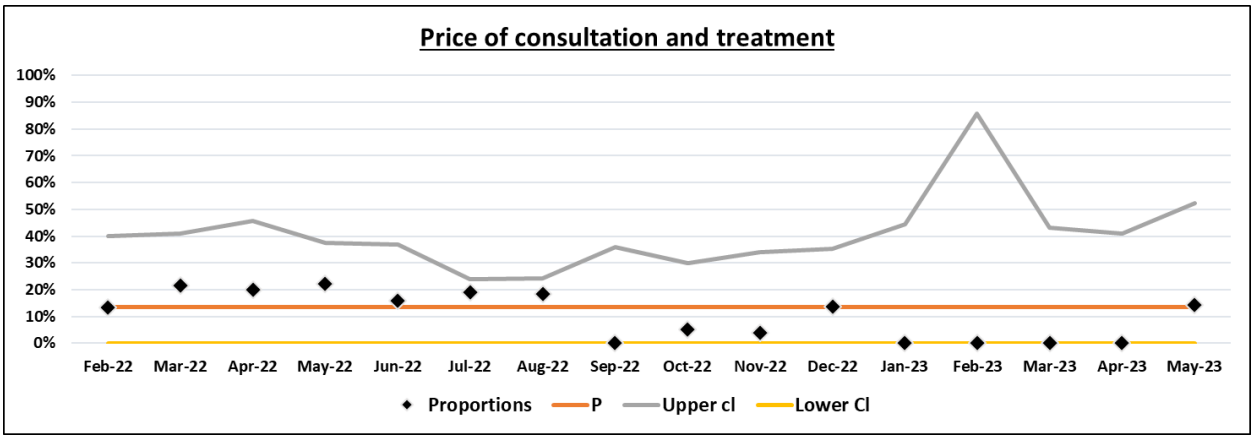

Figure 17

In figure 17 above the response nonconformities for Price of consultation and treatment are within control for the months of February 2022 till May 2023.

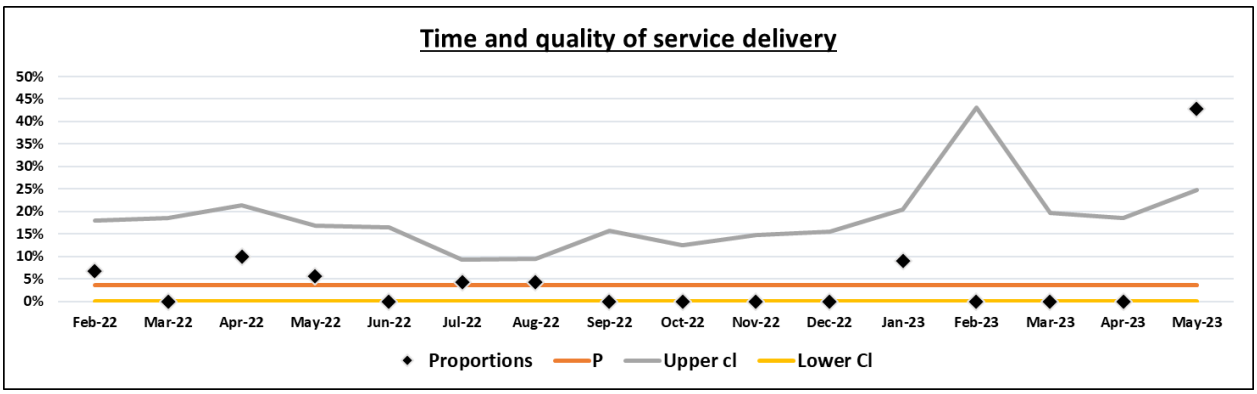

Figure 18

In figure 18 above the response nonconformities for Time and quality of service delivery are within control for the months of February 2022 till April 2023. But it got out of control during the month of May 2023.

The u-chart is applied on the consolidated data for each question to determine the non-conformity per question.

u chart is used to measure the number of non-conformities per question.

Here also, the mean is the average amount of variations in the data.

Here also, the upper control limit is taken as three standard deviations higher from the mean and the lower control limit is taken as the three standard deviations lower than the mean.

So those data points which are within the two control limits are taken as within control. Those data points which are beyond the two control limits are taken as out of control processes and those need to be investigated.

The formula for the average number of non-conformities per unit (u) is:

$$u = \frac{\sum c}{n}$$

Equation 5

Where:

$u =$ average number of nonconformities per unit

$c =$ number of nonconformities in the sample

$n =$ size of the sample (constant)

$$UCL = u + 3\sqrt{\frac{u}{n}}$$

Equation 6

$$LCL = \max\left(u - 3\sqrt{\frac{u}{n}}, 0\right)$$

Equation 7

Where:

$UCL =$ Upper Control Limit

$LCL =$ Lower Control Limit (Note: LCL cannot be less than 0)

In the graphical representation of data, U represents the mean, Upper cl represents the Upper control limit and Lower cl represent the Lower control limit while u represents the data each data point.

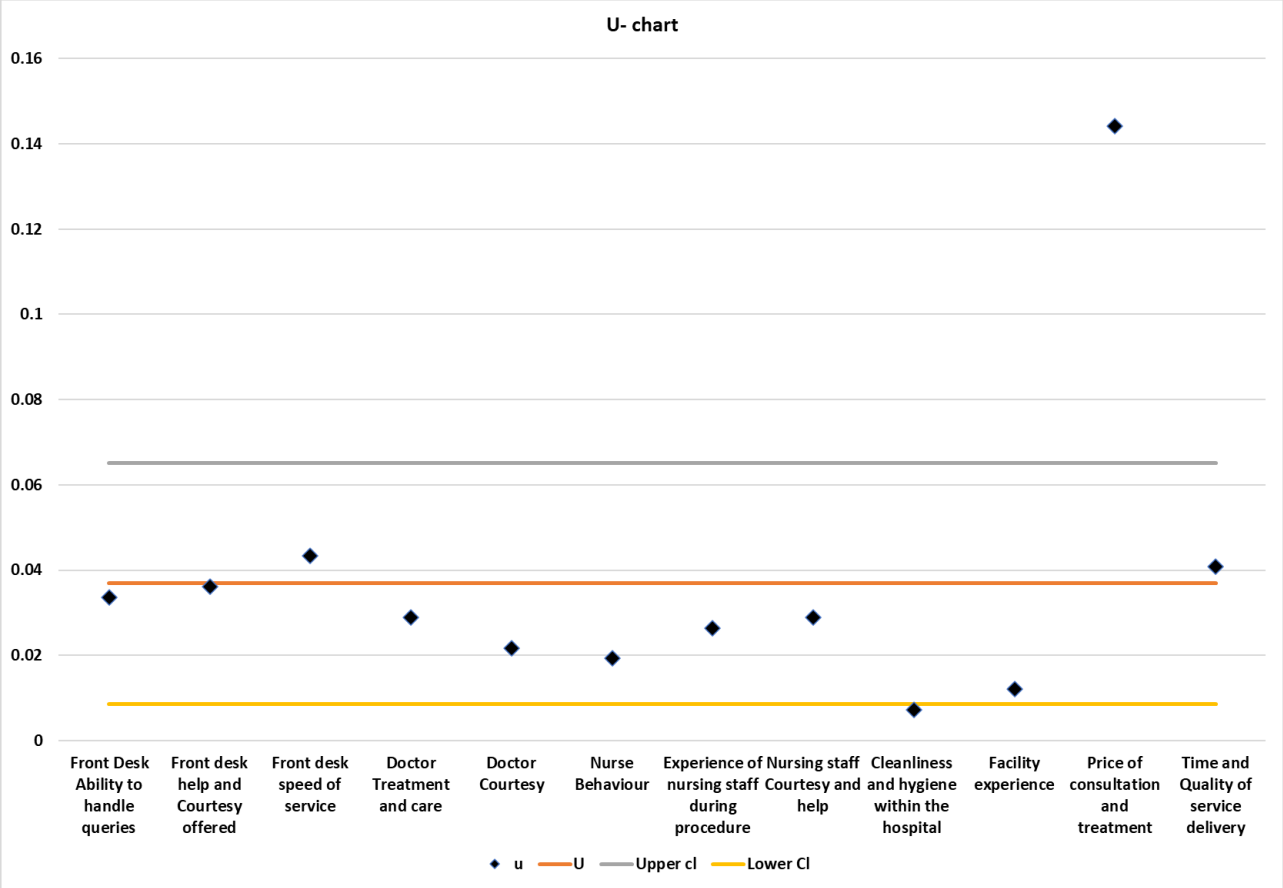

Figure 19

The response nonconformities per question for all the months from February 2022 till May 2023 are being presented in figure 19 above. The only out of control response is the question related to the price of treatment.

5. Discussions:

The responses are collected through paper forms for the period of study. But requirement arises to generate a Google form to reduce staff intervention. This could have resulted in a spike in negative response.

The response of nonconformities is due to deficient service resulting in reduced quality of service delivery by the Thumbay Dental Hospital.

The reason for non-conformities is enquired and root cause analysis is done.

The front desk related nonconformity response is due to extension of waiting time at the front desk. The front desk staff are not knowledgeable enough to respond to any type of query from the patients.

It is so because out of the total seven staff assigned to the front desk job five staff have experience of less than six months. Also, delay happens due to insurance payment confirmation from the insurance companies. Being a small day care hospital, it does not have dedicated front desks and a separate insurance staff. Hence the front desk staff are burdened with two responsibilities. This causes higher waiting time for the patients.

The nursing staff related response nonconformities is due to non-assignment of dedicated nursing staff to a newly joined pedodontist. This is why nursing staff must take turns in supporting the pedodontist for routine procedures. This causes delay in responding to patient requirements.

The cleanliness related nonconformities are due to failure of automated evacuation system in a dental chair during a procedure on one count. This caused spillage of wastewater in the operating room.

The time and quality related nonconformities of response is because patient must wait long hours or sometimes days to get confirmation from the insurance companies for payment of procedure fees to even start a procedure.

The u-chart shows the consolidated response nonconformities per question item. According to the u chart the question about price of treatment received the most negative response. The reason

being most of the health insurance products do not cover dental treatments. Although sometime insurance companies allow it but there is always the requirement of co-pay by the patient.

The study limits itself to the identification of out-of-control responses which are the result of out-of-control processes and investigating the reasons for deficiency and recommendations for improvement thereof.

The study also limits itself from proclaiming the google form or online survey responses systems are more robust. For these further studies are required.

6. Conclusions:

The statistical control charts have a good sensitivity to detect out of control processes. The study highlights the importance of control charts in operational quality assurance in a dental hospital setting. The control chart can act as a filter to respond to those out-of-control irregularities than routine process deviations. The control charts can be implemented on patient satisfaction survey data successfully. This method can be implemented in dental hospitals for process upgradation and quality improvement in the dental hospital.

6.1 Recommendations:

1. More experienced staff should man the front desk. For this new hiring can be done or transfer of manpower from other Thumbay health units can be contemplated.
2. Nursing staff support should be extended to new dentists.
3. Periodic maintenance of dental chairs and other equipment should be done proactively by the biomedical department.
4. More health insurance providers should be brought under the dental hospital insurance network.

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Annexure:

Questionnaire-

1. Can the Front Desk handle queries effectively? قدرة المكتب الأمامي على التعامل مع جميع استفساراتك

Outstanding

Good

Satisfactory

Poor

Very Poor

2. What is the front office standard of courtesy and help offered? المكتب الأمامي المجاملة والمساعدة المقدمة

Outstanding

Good

Satisfactory

Poor

Very Poor

3. What is the speed of service for the front desk? سرعة المكتب الأمامي في تقديم الخدمة

Outstanding

Good

Satisfactory

Poor

Very Poor

4. What is the standard of Doctors' treatment and care? علاج الأطباء ورعايتهم

Outstanding

Good

Satisfactory

Poor

Very Poor

5. What is the standard of doctors' courtesy? مجاملة الأطباء

Outstanding

Good

Satisfactory

Poor

Very Poor

6. What is the standard of nursing staff behaviour? سلوك طاقم التمريض

Outstanding

Good

Satisfactory

Poor

Very Poor

7. What is the experience of nursing staff during the procedure? خبرة حول طاقم التمريض أثناء الإجراء

Outstanding

Good

Satisfactory

Poor

Very Poor

8. What is the standard of nursing staff courtesy? طاقم التمريض مجاملة ومساعدة

Outstanding

Good

Satisfactory

Poor

Very Poor

9. What is the standard of cleanliness and hygiene within the hospital? النظافة والنظافة داخل المستشفى

Outstanding

Good

Satisfactory

Poor

Very Poor

10. What is the experience with facility amenities? الخبرة والمرافق

Outstanding

Good

Satisfactory

Poor

Very Poor

11. What is the experience with the price of treatment? سعر الاستشارة والعلاجات

Outstanding

Good

Satisfactory

Poor

Very Poor

12. What is the experience with the overall time and quality of service? وقت وجودة تقديم الخدمة

Outstanding

Good

Satisfactory

Poor

Very Poor

13. Nationality جنسية: _____

14. Gender جنس

Male

Female

Others

15. Age in Years العمر بالسنين: _____