SECTION A. GENERAL INFORMATION

1. **Title of Research Project**

Factors behind the growing rate of unnecessary caesarian sections in Three Tertiary care hospital of Rawalpindi, Pakistan.

2. **Code of the project:** RPPH 18-15
3. **Name of Principal Investigator:** Prof. Dr Rizwana Chaudhri
4. **Country**: Pakistan
5. **TSA Number:** Contract # 202400707
6. **Reporting period:** 21st March till 1st November 2019
7. **Objectives of the research proposal**:

The project was designed with the following objectives:

General objective: the overall aim expected to be achieved from this research

The overall purpose of this research is to study the overall burden of Cesarean sections in public health hospitals in Pakistan. The study also aims to identify the un-necessary cesarean sections along with associated factors to provide recommendations to avoid unnecessary cesarean sections.

Specific objectives: Following are the specific objectives of this research:

- To calculate the proportion of Cesarean sections conducted in public health hospitals in Rawalpindi, Pakistan to assess the burden of CS
- To determine the appropriateness of Cesarean sections in public health hospitals in Pakistan by using Robson criteria
- To explore the various factors including personal, social, cultural, medical provider and system related factors that influence the non-judicious use of Cesarean sections in Pakistan
- To provide recommendations which could be implemented to avoid non-judicious and unnecessary use of cesarean sections

SECTION B. TECHNICAL REPORT

METHODOLOGY

It was a cross-sectional study conducted in district Rawalpindi; one of the largest districts of Punjab Pakistan, with a population of over 5.5 million. It is geographically connected to Islamabad, the capital city of Pakistan and not only serves the population of the district itself but gets huge influx of patients from Islamabad and Khyber Pakhtunkhwa (the 3rd most populous province in Pakistan). Study site includes 03 largest tertiary care public hospitals which serve more than 50% of the population in the district. These institutions are Holy Family Hospital (HFH), Benazir Bhutto Hospital (BBH) and District Headquarter Hospital (DHQ). These 03 public sector hospitals are affiliated with Rawalpindi Medical University (RMU). These

hospitals are the main referral hospitals providing medical facilities to Rawalpindi as well as neighboring areas including Chakwal, Attock, Mianwali, Taxila and Azad Jammu & Kashmir. There are four separate departments of gynecology and obstetrics working in these 3 facilities and altogether an average number of 2000 deliveries are conducted per month. Since many stakeholders were involved in the project, the initial time was spent in careful planning and ensuring all stakeholders were involved.

Preparatory Phase: During this phase pre-data collection were undertaken to facilitate the data collection. Broadly these activities included:

- Stakeholders meeting
- Ethical approval
- Hiring and training of research medical officers incl. refresher
- Pilot testing

Stakeholder meetings: Number of meetings was held to create an enabling environment. The details of these meeting were as following:

- Meeting with HODs: Meeting were held with all the four head of the departments of three tertiary care hospitals of Rawalpindi Medical University (RMU) which included Holy Family Hospital Gynae unit I (HFH GU1) and Gynae Unit II (HFH GU 2), Benazir Bhutto Hospital (BBH) and District Headquarter Hospital (DHQ). The main purpose of the meeting was to inform them of the project details, assist in identification of doctors working in the hospital who will facilitate the research activities, identification of the data collection team and helped core research team including to understand the registration process of a woman who comes for delivery, record keeping of all deliveries, C-section patient hospitalization etc. One focal person apart from HOD of the Gynae unit was also identified to work with core research team in each unit.
- Meeting with focal person and doctors: An initial meeting was held with focal person of each unit followed by meeting all doctors working within the units. Through the morning meeting which is part of hospital routine, study objectives, methodology and requirement of information were briefed. All procedure of women registration till delivery was reviewed; different registers where data of woman were recorded were checked to assess the quality of data for the core 6 variables of Robson classification. Process of recruitment and obtaining the data of all deliveries especially the women who had under gone C-section was discussed and how the hospital staff would facilitate the research medical offices was emphasized. To update and maintain registers were also stressed in the meeting.
- Modification of the registers; In all units it was observed that two main registers one for SVDs and one for C-section including both elective and emergency were maintained. All 6 core variables of Robson were part of the registers except information on onset of labour. Section on this information was added in hospital routine data collection register.
- Monitoring process of routine data recording mechanism: After all debriefing meeting with hospital medical doctors and staff; research medical officers and PI/Co-PIs monitor

the recording mechanism for next two weeks. During this phase quality of completeness of the registers were also checked.

Ethical approval: Ethical approval of the study was obtained from Rawalpindi Medical University ethical board.

Study population

Inclusion Criteria: All female patients above 18 years of age who were admitted to the gynae/obstetric unit of the selected hospitals and had undergone a cesarean section for the delivery of the baby

Exclusion Criteria: Following patients were excluded from the study

i) Patients with critical post-operative complications

ii) Those who left against medical advice of doctors (as they won't be able to provide required information)

iii) Patients who refused to provide informed consent

Following the above mentioned criteria, our case definition for study subjects would be "all females, aged 18 years or more who have been delivered by cesarean section at one of the selected hospitals for this study and are willing to participate in the study and provide informed consent".

Sample Size

The sample size for this study was calculated to determine the two specific objectives

i) To determine the proportion of non-judicious Cesarean sections among the total number of CSs conducted. With an assumed prevalence of 50% of the outcome variable to give a maximum sample size, with 95% confidence interval and a 3% bound on the error of estimation, the total sample size calculated to determine the proportion of unnecessary CS came up to be 1093, which was inflated by 10% to account for sampling errors. Thus the final sample size was calculated to be approximately 1200 patients who underwent CSs.

ii) To determine the associated factors with non-judicious CS, through a case-control analysis where non judicious CS are the cases while judicious CS are the controls. With an assumption that approximately 1/3rd of the CS were non-judicious, we used the following formula to calculate the sample size

$$n = \left(\frac{r+1}{r}\right)\frac{(\bar{p})(1-\bar{p})(Z_{\beta}+Z_{\alpha/2})^2}{(p_1-p_2)^2}$$

With a case-control ration of 1:3 and a CI of 95% and a power of 90% with the prevalence of exposures kept at a minimum of 5% among controls we calculated a sample of 394 cases and 1182 controls. Keeping 10% inflation for data errors, we are hopeful that by studying 1800 CSs, we would be able to achieve our objectives.

Thus the total sample size to account for both component 1 and 2, we need to interview 1800 women who underwent CS. This sample size was equally divided among the 04 units of the selected hospitals with 450 women with CS per unit.

Data Collection technique

Data on 6 core Robson criteria of all women who were admitted in the Obstetric wards and delivered in the selected hospitals were recorded in a log sheet designed for the study. Data from the hospital registered were extracted and recoded in the log sheet. Among these women all those mothers who have undergone a cesarean section regardless of their parity were approached, consented and recruited in the study.

Data collection tools: Two data collection tools were developed in light of the objectives and these were:

- **Log sheet:** Due to lack of an electronic recording system of women delivering in the hospital log sheet format was developed. This format collected information on all the 6 core Robson variables along with woman hospital registration number of all the deliveries either vaginal or C-section which were done during the study period (see Annex 1). All information required for this format was extracted from the hospital delivery registers by research medical officers on daily basis. These log sheets were maintained in hard copies and sent to central research office twice a week.
- **Structured Questionnaire:** This questionnaire collected information from all women who underwent C-section after obtaining consent via face to face interview. It collects information on variables to understand the factors for unnecessary C-section, containing questions on socio-demographic and personal characteristics, maternity information, health seeking and cultural factors etc.

Data collection process

Data collection was done in two steps:-

First of all, a log of all deliveries conducted in the selected health facilities was made in the structured log sheet based on the 06 Robson criteria. Information was extracted from hospital registered on this log sheet on daily basis. This sheet was used to calculate the proportion of CS conducted in each health facility. All patients who under-went cesarean sections were approached and the eligibility to participate in the study were confirmed. Once the patient was found to be eligible for the study, the research team took informed consent and interviewed the patient via a face to face interview. Each participant was given a unique registration number which served as the study code. The administration of the questionnaire took approximately 10-15 minutes. Interviews were conducted in local language. All data were entered in tablets using real time data entry and at the end of the day information was uploaded on central server. The data entry program was developed in Open Data Kit (ODK) application.

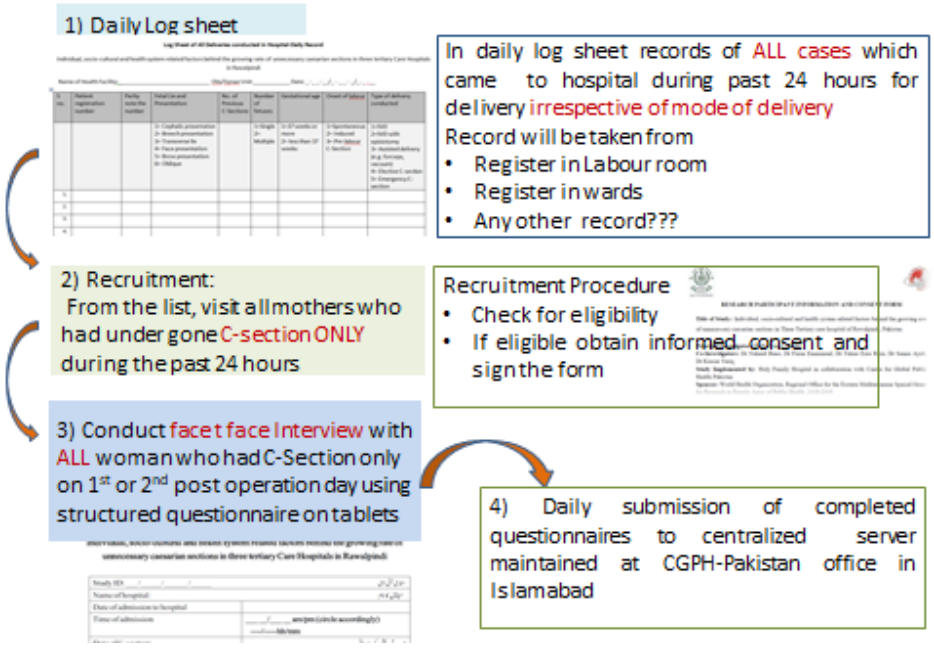
Hiring and Training of research team:
Two medical doctors in each hospital who were already working in the respective hospitals were hired as research medical officers. One other senior doctor was designated as focal person who monitored and facilitated data collection in their respective hospital.

A two days training was conducted on 16th and 17th May 2019 in Holy Family Hospital. All stakeholders including Country representative of WHO Dr. Mahipala and Dr. Qudsia Uzma, National Professional Officer, Maternal, Newborn, Child and Adolescent Health, Vice chancellor of Rawalpindi Medical University, HODs of Gynae /obs in Holy family, Benazir Bhutto hospital and DHQ hospital, focal persons and research medical officers participated. Introduction and implementation of Robson classification system was discussed. Data collection tools were explained and practiced. Monitoring and quality assurance process was also discussed. One day refresher training was conducted on 11 June 2019 to update the research team on the modifications in the tool or procedure after pilot testing.

Pilot testing was conducted soon after the training of research medical officers. Based on findings of pilot testing modification in the Urdu phrasing of question were made along with few changes in the questionnaire. Issues of lack in communication skills and record keeping were observed. During pilot testing and later in refresher training special emphasis was made to improve communication skills while interviewing the patients and ensuring maintaining care when entering the data.

Data management plan:
In each unit, two trained interviewers collected data on six variables in hard copies of log sheets from the delivery record registers. The data entry team entered this data for analysis into excel sheets which designed to calculate Robson group of the delivered woman. Structured questionnaire was developed on Open Data Kit (ODK) application with real time data entry using tablets. All information was uploaded and achieved on daily basis. Uploaded information was later converted to SPSS for data cleaning and process. Data base was cleaned on regular basis specifically on all six variables mentioned in log sheets and counter rechecked was done by medical history of patient. Complete data collection and management plan is shown in figure 1.

Figure 1: Data collection procedure



Quality assurance mechanism: Different tiers of quality assurance mechanism were set. Apart from hiring competent medical doctors and through training; daily monitoring visit was conducted both by hospital focal person as well as by core research team of PI/Co-IPs. A whatsApp application was also developed which used for monitoring as well as for exchange of information and sharing of daily updates among medical researchers and data management team. Data quality issues identified in formats were also communicated using tis application and where needed pictures were shown to help data collectors for better understanding in order to avoid similar mistakes. Monitoring visits to hospital were carried out for verification of the collected data. Core team frequently monitored the quality of data on log sheets by counter checks.

Data collection Period

Data collection was conducted from 13th June to 31st July 2019.

Data Analysis:

Data was analyzed according to the recommendations of the WHO Robson classification manual[1] and synthesized according to the standardized reporting tables provided by the manual. According to the WHO methodology, the analysis should follow the following key steps. First, each case of birth was classified into one of the Robson groups, using six key variables (parity, previous CS, onset of labour, number of fetuses, gestational age, fetal lie presentation). All women who delivered in the 3 hospitals within the data collection period were classified into the 10 groups described by Robson and then into 13 groups using the subdivision of groups 2, 4 and 5Second, data were assessed for: (1) Quality. (2) Type of population. (3) CS. As recommended by WHO Robson guideline, relevant additional information were collected and analyzed as complementary information to allow an in-depth interpretation of CS practices. Specifically, the

following types of variables collected by individual-patient medical record were used: maternal age, gestational age, maternal pathological conditions (e.g. diabetes, hypertensive disorders and others), fetal pathological conditions, CS indications. For each step, findings were compared with the suggested two sources of interpretation in the WHO manual[1]the reference ranges and interpretation by Michael Robson.

Result:

The total number of women delivered during the study period was 5657 out of which CS deliveries were 2255 in the four units of three hospitals during the study period. Overall CS rate in the study population was 39.9%. Among those who had C-sections done 55.8% had pre-labour c-section, 5.5% had induction of labour (IOL).and 17.2% were preterm deliveries (before 37 weeks).

1- Analysis by Robson classification

Table 1: The Robson classification report table

C1	C2	C3	C4	C5	C6	C7
Group	**No of CS in Group**	**Total women in group**	**Group Size (%)**	**Group CS rate (%)**	**Absolute contribution (%)**	**Relative contribution**
1	152	940	16.6	16.2	2.7	6.7
2	286	492	8.7	58.1	5.1	12.7
2.a	88	293	5.2	30.0	1.6	3.9
2.b	198	199	3.5	99.5	3.5	8.8
3	78	1485	26.3	5.3	1.4	3.5
4	115	322	5.7	35.7	2.0	5.1
4.a	20	227	4.0	8.8	0.4	0.9
4.b	95	95	1.7	100.0	1.7	4.2
5	941	1057	18.7	89.0	16.6	41.7
5.1	487	600	10.6	81.2	8.6	21.6
5.2	454	457	8.1	99.3	8.0	20.1
6	85	100	1.8	85.0	1.5	3.8
7	127	159	2.8	79.9	2.2	5.6
8	54	99	1.8	54.5	1.0	2.4
9	28	28	0.5	100.0	0.5	1.2
10	389	975	17.2	39.9	6.9	17.3
	2255	**5657**	**100.0**	**39.9**	**39.9**	**100**

Table 1 presents the Robson classification of all women which showed that group 3 *(multiparous without previous CS, single cephalic at term, in spontaneous labour)* and group 5 (all multiparous women with at least one previous CS, with a single cephalic pregnancy, ≥37 weeks) were the most represented groups (26.3.0% and 18.7% respectively) whereas group 10 (women with a single cephalic pregnancy <37 weeks gestation, including women with previous CS(s)) was the third most represented group (17.2%).

The major contributors to CS were group 5 *(multiparous with at least one previous CS, single cephalic at term)* 41.7% and group 10 *(women with a single cephalic pregnancy <37 weeks gestation, including women with previous CS(s))* 17.3% and group 2 (Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation) 12.7% and group 1 *(nulliparous without previous CS, single cephalic at term, in spontaneous labour)* 6.7%.

Segregated analysis of the data was done to look at the hospital wise Robson classification which is shown in Table2a, 2b, 2c and 2d

Table 2a: Robson classification report for Holy Family Unit 1

C1	C2	C3	C4	C5	C6	C7
Groups	**No. of C-S**	**Total Women in Group**	**Group Size (%)**	**Group C-S Rate (%)**	**Absolute Contribution (%)**	**Relative Contribution**
1	26	250	17.1	10.4	1.78	5.3
2	52	104	7.1	50.0	3.57	10.5
3	16	383	26.3	4.2	1.10	3.2
4	25	76	5.2	32.9	1.71	5.1
5	220	263	18.0	83.7	15.09	44.4
6	25	34	2.3	73.5	1.71	5.1
7	36	50	3.4	72.0	2.47	7.3
8	13	30	2.1	43.3	0.89	2.6
9	6	6	0.4	100.0	0.41	1.2
10	76	262	18.0	29.0	5.21	15.4
	495	**1458**	100.0	34.0	33.95	100
			100%	**Overall CS Rate**	**Overall CS Rate**	**100%**

Table 2b: Robson classification report for Holy Family Unit 2

C1	C2	C3	C4	C5	C6	C7
Groups	**No. of C-S**	**Total Women in Group**	**Group Size (%)**	**Group C-S Rate (%)**	**Absolute Contribution (%)**	**Relative Contribution**
1	50	239	15.7	20.9	3.29	8.4
2	73	162	10.7	45.1	4.80	12.3
3	18	357	23.5	5.0	1.18	3.0
4	23	95	6.2	24.2	1.51	3.9
5	229	257	16.9	89.1	15.06	38.6
6	16	20	1.3	80.0	1.05	2.7
7	38	52	3.4	73.1	2.50	6.4
8	19	35	2.3	54.3	1.25	3.2
9	7	7	0.5	100.0	0.46	1.2
10	120	297	19.5	40.4	7.89	20.2
	593	**1521**	**100**	**39.0**	**39.0**	**100**
			100%	**Overall CS Rate**	**Overall CS Rate**	**100%**

Table 2c: Robson classification report for Benazir Bhutto Hospital

C1	C2	C3	C4	C5	C6	C7
Groups	**No. of C-S**	**Total Women in Group**	**Group Size (%)**	**Group C-S Rate (%)**	**Absolute Contribution (%)**	**Relative Contribution**
1	22	265	16.8	8.3	1.4	3.3
2	140	173	10.9	80.9	8.8	20.9
3	7	435	27.5	1.6	0.4	1.0
4	55	95	6.0	57.9	3.5	8.2
5	287	308	19.5	93.2	18.1	42.8
6	20	21	1.3	95.2	1.3	3.0
7	36	39	2.5	92.3	2.3	5.4
8	14	22	1.4	63.6	0.9	2.1
9	12	12	0.8	100.0	0.8	1.8
10	77	212	13.4	36.3	4.9	11.5
	670	**1582**	100.0	42.4	42.4	100
			100%	**Overall CS Rate**	**Overall CS Rate**	**100%**

Table 2d: Robson classification report for DHQ

C1	C2	C3	C4	C5	C6	C7
Groups	**No. of C-S**	**Total Women in Group**	**Group Size (%)**	**Group C-S Rate (%)**	**Absolute Contribution (%)**	**Relative Contribution**
1	54	186	17.0	29.0	4.9	10.9
2	21	53	4.8	39.6	1.9	4.2
3	37	310	28.3	11.9	3.4	7.4
4	12	56	5.1	21.4	1.1	2.4
5	205	229	20.9	89.5	18.7	41.2
6	24	25	2.3	96.0	2.2	4.8
7	17	18	1.6	94.4	1.6	3.4
8	8	12	1.1	66.7	0.7	1.6
9	3	3	0.3	100.0	0.3	0.6
10	116	204	18.6	56.9	10.6	23.3
	497	1096	100.0	45.3	45.3	100.0
			100%	**Overall CS Rate**	**Overall CS Rate**	**100%**

Looking at the overall C-section rates of the 4 units HFH GU1 had the lowest rate at 34.0% followed by 39.0% from HFH GU2, 42.4% from BBH and 45.3% from DHQ. Contribution to C-section in all four units also showed similar pattern as in total database. The largest relative contributor to the CS rate was group 5; women with at least one previous CS and a term, singleton, cephalic-presenting pregnancy ≥37 weeks gestation followed by Group 10 (women with a single cephalic pregnancy <37 weeks gestation, including women with previous C-

section(s)) in all 3 units of HFH and DHQ except in Benazir Bhutto hospital second highest group was group 2 (Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation). The third most contribution was in both units of Holy Family Hospital by group 2 (Nulliparous women with a single cephalic pregnancy, ≥37 weeks gestation) whereas group 10 and group 1 were the third highest contributor in BBH and DHQ respectively.

Data Quality, Type of Population and C-Section Rates

a. Data Quality: Table 3 summarized findings and their interpretation, related to the data quality

Table 3 Assessment of the quality of data

Steps for interpretation	Interpretation by Robson	Example: MCS population	Our findings	Final interpretation
STEP 1. Total number of CS and total number of women delivered	Should be identical to the numbers provided by official register	NA	Total CS=2255 Total deliveries=5657	Suggested no major problems in data quality
STEP 2. Size of group 9 (should be less than 1%)	<1%	0.4%	0.5%	
STEP 3. CS in group 9 (should be 100% by convention)	100%	88.6%	100%	

Abbreviations: CS, caesarean section; CTG, cardiotocography; IOL, induction of labour; MCS, Multicountry Survey; MCS reference population: was the population of the WHO MCS with relatively low CS rates and, at the same time, with good outcomes of labour and childbirth; NA, data not available.

C-section rate and size of group 9 (single pregnancy, transverse or oblique lie, including previous C-section), when compared with the Robson interpretation and the MCS example, suggested no major problems in data quality (table 3)

Type of Population

Table 4 synthesizes the assessment of the type of population. In steps 2 and 9, the size of group 3 (multiparous without previous C-section, single cephalic at term, in spontaneous labour) plus group 4 (multiparous without previous C-section, single cephalic at term with IOL or C-section before labour) was larger than the Robson comparison (32% vs about 30%) while the ratio of the size of group 6 (nulliparous, single breech) versus group 7 (multiparous, single breech, including previous C-section) was lower (0.6) than the Robson comparison. These findings revealed that most of the population in our study was represented by multiparous women. In step 3 analyses revealed that there may be relatively low C-section rate in the previous years, or to a recently increased C-section rate in hospitals.

Table 4: Assessment of the type of population

Steps for interpretation	Interpretation by Robson	Example: MCS population	Our findings	Additional information	Final interpretation
Step1: Size of group 1+group 2	35%–42%	38.1%	25.3%	Nulliparous women in population 23.3%	This can be explained low prevalence of nulliparous woman in our population
Step2: Size of groups 3+4	30%	46.5%	32%	Multiparous women in population 76.7%	Rate higher than Robson. This may be explained by a high prevalence of multiparous women in our population.
Step3: Size of group 5	Half of total CS rate	7.2%	18.7%	-	Slightly lower than half of total C-section rate. This, as suggested by the WHO manual, may be due to relatively low C-section rate in the previous years, or to a recently increased C-section rate or to misclassification.
Step4: Size of groups 6+7	3%–4%	2.7%	4.6%	-	Higher than both comparisons. This may be explained by the hospitals being the tertiary care referral centers
Step5: Size of group 8	1.5%–2%	0.9%	1.8%	-	Rate in line with Robson references
Step6: Size of group 10	<5%	4.2%	17.2%		Higher than both comparisons. This may be explained by the hospitals being the tertiary care referral centers with high proportion of preterm births in the population or by misclassification of gestational age
Step7: Ratio of the size of group one versus group 2	Ratio 2 or higher	Ratio 3.3	Ratio 1.9		Lower ratio suspect poor data quality: nulliparous women who received oxytocin for augmentation (acceleration) of labour (and should be in Group 1) may have been misclassified as "induction" (and incorrectly classified as Group 2). If data collection is correct, a lower ratio may indicate that high induction/pre-labour C-section

					issue which may indicate a high risk population in nulliparous women and are likely therefore to have a high C-section rate (deserving further investigation).
Step8: Ratio of size of group 3 versus group 4	> 2:1	Ratio 6.3	Ratio 4.6		Rate lower than MCS. This may be explained by: (1) Misclassification of augmentation as IOL (2) Inappropriate indication to IOL (deserving further investigation).
Step9: Ratio of size of group 6 versus group 7	Usually 2:1	Ratio 0.8	Ratio 0.6	.	This may be explained by: (1) High number of multiparous women in our population

Abbreviations: CS, caesarean section; CTG, cardiotocography; IOL, induction of labour; MCS, Multicountry Survey; MCS reference population: was the population of the WHO MCS with relatively low CS rates and, at the same time, with good outcomes of labour and childbirth; NA, data not available.

Step 4 explained that being the referral hospitals there was high rate of breech deliveries In step 6, group 10 (single cephalic, <37 gestation weeks, including previous C-section) was slightly larger than the Robson comparison most likely due to the fact the being a tertiary care hospitals there were more preterm births or lack of knowledge of correct gestational weeks Ratio of size of group 3 versus group 4 was lower than MCS which may be explained by misclassification of augmentation as IOL or IOL done with inappropriate indications.

Table 5: Assessment of the C-section rates

Steps for interpretation	Interpretation by Robson	Example: MCS population	Our findings	Additional information from data base (indications of C-sections)	Final interpretation
C-section rate in group 1	Under 10% are achievable	9.8%	16.2%	Abnormal CTG was the indication in 28.2% of cases and fetal distress in 26.6 % cases	CS rate higher than Robson and MCS. This may be explained by indications (abnormal CTG/suspected fetal distress)
C-section rate in group 2	Consistently around 20%–35%	39.9%	58.1%	Abnormal CTG was the indication in 52.0% of group 2a and 29% in group 2b. precious pregnancy 40.4% Failed induction (30.7%) suspected fetal distress (24.3%).	C-section rate higher than Robson and MCS. This may be possibly due to poor choice of women to induce or poor success rates for induction or inappropriate indications to C-section in IOL and pre-labour C-section.
C-section rate in group 3	Not higher than 3.0%.	3.0%	5.3%	Abnormal CTG was the indication in 27.7%.cases and fetal distress 19.7	C-section rate higher than Robson and MCS. This may be explained by misclassification (group 5 misclassified as group 3) or, most probably, by inappropriate indication to C-section (CTG misinterpretation).
C-section rate for group 4	It rarely should be higher than 15%	23.7%	35.7%	Abnormal CTG was the indication in 50% in group 4a and 27.1% in group 4b. ailed induction was an indication in 31.3% of group 4a.	C-section rate higher than Robson and MCS. C-section rate higher than Robson. Size of group 4b suggests low pre-labour CS in this group, while the rate of C-section in group 4a was high mainly due to CTG abnormalities and failed IOL. This may be explained by inappropriate indication to C-section (CTG misinterpretation)
C-section rate in group 5	Rates of 50%–60% are considered appropriate	74.4%	89%	Previous one C-section was the indication in 98%.	C-section rate higher than Robson and MCS. Low rate of IOL in this group. The vast majority are C-section for past section. This may be explained by the group size or a policy of scheduling pre-labour C-section (low offer of trial of labour). Also, women's

					preference, based on previous information, for repeating C-section may have a role.
C-section rate for group 8	Usually around 60%	57.7%	54.5%		Variations will depend on the type of twin pregnancy and the ratio of nulliparous/multiparous with or without a previous scar.
C-section in group 10	Usually around 30%	25.1%	39.9%	Cases of high risk pregnancy: 40% previous 2 C-sections, 10.2% placenta previa cases, 5.6%preeclampsia and Intrauterine growth retardations	If higher than 30%, it is usually due to many cases of high risk pregnancies (e.g. fetal growth restriction, preeclampsia) that will need preterm pre-labour C-section.
Relative contribution of groups 1, 2 and 5 to the overall C-section rate	Normally contribute to 2/3 (66%) of all C-section performed in most hospitals	Contributed to 63.7% of all C-section	61.1%		These three groups should be the focus of attention if the hospital is trying to lower the overall C-section rate.
Absolute contribution of group 5 to overall C-section rate	NA	Responsible for 28.9% of all C-section	Absolute contribution: 16.6% Relative contribution: 41.7%	.	If it is very high, this may indicate that in previous years, C-section rates in Groups 1 and 2 have been high and it is worth exploring further

The assessment of C-section rates (see table 5) was complemented by an analysis of the indications for C-section. In group 1 (nulliparous, single cephalic, >37 weeks in spontaneous labour), C-section rate was 16.2%, higher than references nearly one third of C-section indications in this group were by abnormal CTG (28.2%) and fetal distress (26.6%) and precious pregnancy (25%). C-section rate in group 2 was 58.1%. The main indication in this group were abnormal cardiotocography (CTG) 81.0%, precious pregnancy 40.4% (out of which 29.7% were pre labor deliveries), failed induction (30.7%) and suspected fetal distress (24.3%). Higher rate in group 2 can be explained by poor choice of women on which induction process was started or poor success rates for induction. In group 3 C-section rate was 5.3% with most common indications of precious pregnancy, abnormal CTG and fetal distress. Size of group 4b suggest low pre-labour C-section in this group, while the rate of C-section in group 4a was high mainly due to CTG abnormalities (50%) and failed IOL (31%). The overall C/S rate of group 5 was 89.0% with C-section rate of 81.2% in group 5.1 i.e. women with previous 1 C-section. Other indications for C-sections in group 5.1 were abnormal CTG (14.3%), postdated (10.6%) and precious pregnancy (8.2%). This may be explained by the large group size or hospital practice of performing pre-labour C-section (low offer of trial of labour). C-section rate in group 8 was 54.5% which could vary according to the type of multiple pregnancy in population. Group 10 had 39.9% C-section rate which could be explained by many cases of high risk pregnancy i.e. 40% previous 2 C-sections, 10.2% placenta previa cases, 5.6% preeclampsia and intrauterine growth retardations

2-Prevalence of Unnecessary C-section/non-judicial C-sections and their Indications

For factors of unnecessary C-section a preliminary analysis was done in calculated sample size of 1806 C-section.

In general C-section rates in the public tertiary care hospitals were high due to numerous documented reasons. However labeling a C-section as unnecessary is something more complex than simple disease definition because decision of doing a C-section involves careful assessment of all medical, obstetrical reasons for well-being of both mother and baby as well as experience of the medical practitioners. However there are some absolutely necessary indications for performing the C-section and if any of those indicators were not present a C-section was categorized as unnecessary C-Section (UNCS). For preliminary analysis of this study the definition of unnecessary C-section was “absence of any non-medical, obstetrical or foetal indications” for a C-section. Thus based on this absence of complications experience during pregnancy or labour e.g. bleeding due to placeta previa, prolonged/obstructed labour/failure to progress, abnormal fetus positions, precious 2 or more C-sections, placenta accrete etc. and patient demand was defined as UNCS. With this definition overall, 803 out of sample size of 1806 women who underwent C-section had no absolutely necessary indicators thus prevalence of C-sections performed in the 4 units of selected hospitals of RMU was 44.5%. The indications of C-sections among women in whom no absolute reason for C-section was found were shown in table 6. The main five indications of UNCS were previous 1 C-section (52.4%), precious pregnancy (21.6%), breech presentation (13.5%), apparent fetal distress (12.0%) and post-date (8.1%).

Table 6: Indications for C-sections among those with no absolute indicators for operation

Indicators of C-Sections	Percentage (%)
Previous 1 CS	52.4
Precious Pregnancy	21.6
Breech Presentation	13.5
Apparent Fetal Distress	12.0
Post Dates	8.1
Intra Uterine Growth Retardation (IUGR)	5.9
Pre-eclampsia	3.6
Placenta Abruption	2.4
Diabetes	2.2
Macrosomia	1.3
Prolonged Labour	1.0
Eclampsia	1.0
Contracted Pelvis	0.4
Heart Disease	0.3
Fibroid Pregnancy	0.6
Perineal Repair Histroy	0.4
Dystocia	0.3
Cord prolapse	0.4
Umbilical Cord Abnormality	0.1

Comparison of some of the key socio-demographic and obstetrical factors (Table 7) showed that women in group without absolute indicators for C-sections were younger (26.8 ± 5.0 years) compared to women in group with absolute indicators (28.0 ± 4.7 years). Overall 27.5% of women with no absolute indicator were primigravida compared to 20.5%. Whether the patient was registered in the hospital where her C-section was done showed that 56.5% of women were booked (had 3 or more ANC visit) as compared to 50.1% who were non-booked in women without absolute indicators and women with absolute indictors respectively. Presence of any medical illness or surgical history was 6.4% and 48.7% among women with no absolute indicators for C-sections.

Table 7: Comparison of selected Socio-demographic and obstetric factors among patients with and without absolute indicator for C-section

Variables	No absolute indicator	With absolute indicator
Age in completed years		
• Less than 20	4.5	2.7
• 20 to 24	29.2	17.9
• 25 to 29	33.9	39.6
• 30 to 34	22.9	27.3
• Equal or More than 35	9.6	12.5
Mean ± SD (years)	26.8 ± 5.0	28.0 ± 4.7
Gravida		
• Primigravida	27.5	20.5
• 2-4	58.7	58.4
• 5 or more	13.8	21.0
Registration at delivering hospital		
• Registered (2 or less ANC visits)	14.7	14.7
• Booked (3 or more ANC visits)	56.5	50.1
• Non-booked (No ANC visit)	28.8	35.2
Presence of any medical illness	6.4	4.3
Presence of any surgical history	48.7	63.2

Discussion:

WHO proposes the Robson Classification system as a global standard for assessing, monitoring and comparing caesarean section rates within healthcare facilities over time, and between facilities".[1] This study provides an example of implementation of WHO manual for Robson classification in tertiary care hospitals by using a hospital medical record/database to conduct an in-depth analysis of C-section practices. We were unable to identify any study conducted in Rawalpindi, Pakistan by using WHO Robson classification. This report documents an example of how the WHO manual can be used in an action-oriented manner. The WHO manual underlines that neither Robson nor MCS references 'have been validated against outcomes and should not be taken as a recommendation' and 'it is up to the hospital itself to decide what is appropriate care, based on its results and other available evidence'.[1] This study described the whole process of how data were used to analyze C-section rate and to develop recommendations to improve hospital practices. However, few points on key clinical findings can be further discussed here. In most Robson groups, the very high rate of C-section performed for abnormal CTG/suspected fetal distress was a reason of concern. CTG machines are becoming increasingly available as essential equipment for the provision of quality obstetric care. However, the introduction of these technologies has not always been complemented by adequate capacity development. Recently, there have been calls to optimize technical skills of staff on CTG interpretation, by delivering adequate training.[2] Results of this study suggest that improving the quality of CTG interpretation could be an important step towards reducing C-section rates and increasing appropriateness of care. In our study Group 5 had main contribution in C/S rate. Young medical doctors are frightened by vaginal delivery after caesarean section, pelvis is

usually only clinically assessed and CT pelvimetry is rarely done for financial reasons. Trial of scar in singleton pregnancies should be given to reduce rate of repeated cesarean section as the risk of uterine rupture is low. Strategies to reduce the frequency of the procedure should include avoidance of medically unnecessary primary caesarean section. Improved case selection for induction and pre-labour caesarean section could also reduce caesarean section rates. Trend of preforming C-section on previous 1 scar also came up as an important factor for high prevalence of C-sections indicating more research to explore this practice.

Conclusions

The Robson's classification is easy to use. Each maternity unit can compare its rates with those of units of similar level. Performing C-sections on previous 1 scar came out to be the most important reason for high burden of C-section in our tertiary care hospitals. This could be due to the practice of hospital to perform C-sections without giving a vaginal delivery trial to woman, lack of experience of young doctors working in these hospital as these hospitals have large number of trainees for post-graduation, high turnover of patients and limited number of doctors on duty. Unless there is a clear and supported justification for C-section a careful supervised and justified trial of labour should be given to all women.

C-section rate analyzed by Robson criteria showed high or low rate compared with the expected, suggesting potentially inappropriate management which needs to be explored with further research.

Limitations of the study:

C-section rate could vary in different hospitals and settings depending on their capacity / level of complexity, the epidemiological characteristics of the population served and the local clinical management guidelines and should not be taken as a recommendation

Recommendations:

1. Utilization of Robson classification for analysis of C-section indications
2. Training of hospital staff on definitions used for the Robson's classification according to the WHO manual
3. Capacity building of staff in CTG interpretation to avoid wrong interpretations which may help in misclassification of apparent fetal distress to reduce burden of C-section
4. Regular staff meetings for emphasis on diagnosis of fetal distress
5. Consultant meeting explores reasons for high C-sections due to high IOL and pre-labour C-sections. There may be need to update hospital protocols (agreeing on criteria for failed IOL according to recent evidence) and build capacity of young doctors on IOL.
6. Capacity building of staff on the value and procedure of external cephalic version to avoid high rate of C-sections among breech presentation.

SECTION C. FINANCIAL REPORT

Financial Expenditure Update: Only 1st installment (25%) of the total payment was received to the contractor during this reporting period by WHO. Its breakup/detail is as under:-

Budget Breakdown Items	Total Allocated (Amount in TSA)	Total Amount Received	Total Amount Spent
- Materials & Supplies	1,250.00		-
- Local Travel	675.00		200.00
- Field Work	4,400.00		1,684.00
- Training	500.00		148.00
- Dissemination of results	775.00		-
- Other Costs	400.00		-
Total ($)	**8,000.00**	**2,000.00**	**2,033.00**

Signature: _____ _____

Principle investigator
(Prof. Dr Rizwana Chaudhri)

Finance officer of the institute
(Muhammad Faheem Baig)

Date of submission of Report: 30th December 2019

References:

1. World Health Organization. Robson Classification: Implementation Manual, Geneva. 2017 http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/robson-classification/en/ (accessed 16 Oct 2018).
2. Ugwumadu A , Steer P , Parer B , et al . Time to optimise and enforce training in interpretation of intrapartum cardiotocograph. BJOG 2016;123:866–9

Log Sheet of ALL DELIVERIES conducted in Hospital-Daily Record

Individual, socio-cultural and health system related factors behind the growing rate of unnecessary caesarian sections in three tertiary Care Hospitals in Rawalpindi

Name of Health Facility:_____ Obs/Gynae Unit:_____ Date: _ _ _ _/_ _ _ _/_ _ _ _ (new sheet will be filled separately for each day)

S/N	Patient Registration Number	Parity (note the number)	Fetal Lie and Presentation 1= Cephalic presentation 2= Breech presentation 3= Transverse lie 4= Face presentation 5= Brow presentation 6= Oblique	No. of Previous C-Sections	Number of Fetuses 1=Single 2= Multiple	Gestational age (In weeks)	Onset of labour 1=Spontaneous 2= Induced 3= Pre-labour C-Section	Type of delivery conducted 1=SVD 2=SVD with episiotomy 3= Assisted delivery (e.g. forceps, vacuum) 4= Elective C-section 5= Emergency C-section	Study ID Start from 1 till 450 (DO NOT RESTART THE NUMBERING ON NEXT DAY)	Remarks (In case patient refuse or unable to conduct interview write the reason)
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										