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SOCIO-DEMOGRAPHIC, OBSTETRIC AND NON-OBSTETRIC FACTORS INFLUENCING THE INCIDENCE OF CESAREAN SECTION (C-SECTION)

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Abstract

Cesarean sections (CS) and regular vaginal births are two processes for childbirth. Cesarean section is an intricate surgery involving numerous risks such as blood loss, organ damage, allergic reaction to anesthesia, infections and blood clots. Now a days rate of CS is increasing in developed countries. The increased rate of caesarean section can be described by socio-economic status (SES), medical and non-medical factors. Socioeconomic status (SES) is linked to a wide range of maternity services including Cesarean section (CS), whereas the most common medical and non-medical factors are labor dystocia, fetal mal-presentation, multiple gestations, suspected fetal macrosomia, placenta previa, placenta abruption, prolonged labor, fetal distress, birth defects, repeated cesareans, chronic health condition, cord prolapse, cephalopelvic dis-proportion (CPD), preeclampsia, bleeding, IUGR (Intrauterine growth restriction), uterine rupture, gestational diabetes, pelvic tumors, vesico-vaginal fistula repair, AP (anterior and posterior) repair and IUD (intrauterine devices).The aim of this study was to determine the rate of CS and socio-demographic, obstetric and non-obstetric factors influencing the incidence of cesarean section (C-section). This study was conducted at Combined Military Hospital (CMH), Peshawar for a period of 8 months. A standardized questionnaire was made by investigator to evaluate social and physiological status, obstetric factors, and non-obstetric- factors. 400 CS patients participated in this study. The findings of this study showed different socio-economic factors (ethnic variances, age occupation, income status) affecting cesarean section (C- section) delivery rates. The highest CS rate (39.25%) was in the age group of 26-30 years and in non-working women (61.5%). Moreover the high education of pregnant females is greatly associated with C-section rates because of the frequent visits for antenatal care during their pregnancy. Frequency of CS in overweight and obese women were found 139 (34.75%) and 198 (49.5%) of the total cases. As far as obstetric code was concerned, nulliparous women (62.5%) are more likely to be delivered by caesarean section as compared to Multipara 36.8% and Grand Multipara 0.8% when labor is induced.

Keywords: *Cesarean section, Delivery rates, Non-obstetric factors, Nulliparous, Obesity, Obstetric factors, Socioeconomic status, Vaginal birth*

INTRODUCTION

Normally, there are two processes for childbirth: regular vaginal births and Cesarean sections (C-sections). Caesarean section (CS) or Cesarean deliveries, practiced since olden roman times, are described as the deliveries of fetus through surgical incisions of abdominal (laparotomy) and uterine walls (hysterotomy) (1). World Health Organization (WHO) suggested ideal caesarean rates in developed and developing countries are in ranges of 10 – 15 % and 19 % respectively and optimum safety of births should be maintained through caesarean sections (2) and no area in the world is acceptable with a CS rate greater than 10% to 15% (3). United Nation reported (2018), Caesarean section delivery rates in different geographical regions of the world were as follows; Africa (9.2%), Asia (23.1%), Europe (25.7%), Americas (39.3%) and in

all over the world its ratio is 21.1% (4). A needless CS is related with an enhanced risk of mother and fetus death (5).

There is continued debate about the role of women and communities in influencing rising rates of caesarean section (CS). In settings where CS rates exceed recommended levels, mothers and babies are exposed to potential harms that may outweigh the potential benefits. Caesarean delivery is associated with a reduce rate of urinary incontinence and pelvic organ prolapse (6). The increased rate of caesarean section can be explained by Medical and non-Medical factors. The medical factor includes obstetric and non-obstetric factors. Non-obstetric factors are increase in maternal age and body mass index (7) whereas obstetric Factors are repeated caesarean section, presumed fetal distress, failure to progress, breach and transverse births, hypertensive disorders, pelvic disorders, antepartum hemorrhage, near birth complications, postdate pregnancy (8, 9). Doctors schedule C-section for economic gain, time management or for surgical practice.

Socioeconomic status (SES) is linked to a wide range of maternity services including Cesarean section (10). Some women prefer to deliver by surgery because it gives them more control in deciding when their baby is born. This is the most common cause for scheduled C-Section, and it is one of the common factors in increasing number of C-section surgeries in Pakistan. Women prefer this option because it can also reduce some anxiety of waiting for labor to start. The other most common factor in increasing surgical option is that mostly women or new generation doesn't want to face the normal vaginal delivery because of the labor pain (11). The class difference is becoming the main reason in Pakistan for increasing number of Cesarean in many ways. The elite class women can bear high expenses for this procedure in expensive private hospitals.

The most common indications or causes which become the reason for C-Section deliveries are labor dystocia, fetal mal-presentation, multiple gestations, suspected fetal macrosomia, placenta previa, placenta abruption, prolonged labor, fetal distress, birth defects, repeated cesareans, chronic health condition, cord prolapse, cephalopelvic dis-proportion (CPD), preeclampsia, bleeding, IUGR (Intrauterine growth restriction), uterine rupture, gestational diabetes, pelvic tumors, vesicovaginal fistula repair, AP (anterior and posterior) repair and IUD (intrauterine devices) (12). Cesarean section is an intricate surgery involving numerous risks such as blood loss, organ damage, allergic reaction to anesthesia, infections and blood clots (13). The aim of this study was to assess likings for mode of delivery and reasons for preferences for CS in Pakistan.

MATERIALS AND METHODS

This study was conducted at Combined Military Hospital (CMH), Peshawar. A standardized questionnaire was made by investigator to evaluate social status, physiological status, obstetric factors, and non-obstetric factors. 400 subjects participated in this study.

Following Parameters were observed in this study:

- Distribution of study participants was done on the parameters such as social and economic status, family income, working or nonworking women, education status of mother, age of mother, elective, or emergency C-section.
- Physiological status also included in this study such as delayed labor mechanical obstruction, obesity, BMI, extremes of neonatal birth weight, mother carrying multiple babies, placental problems, previous medical history and prolapsed umbilical cord with any health concern.
- Obstetric factors: Type of C-section with blood physiological parameters
- Non-obstetric factors (parity, age, socioeconomic status, previous C-sections, associated diseases like hypertension, diabetes etc)
- The raw data was documented in Microsoft Excel. Statistical analysis will be completed using SPSS to find out correlations among different variables.

RESULTS

EFFECT OF ETHNIC GROUP ON CESAREAN SECTION (C- SECTION) DELIVERY RATES

The findings of this study showed ethnic variances in cesarean section (C- section) delivery rates. Out of 400 deliveries maximum (n=104, 26%) of (C- section) was found in Pathans whereas (n=87, n=76, n=68, n=64. The findings of this study showed ethnic variances in cesarean section (C- section) delivery rates. Out of 400 deliveries maximum (n=104, 26%) C- sections were found in Pathans whereas n=87, n=76, n=68, n=64 and n=1 were found in Hindko, Punjabi, Sindhi, Balochi, and others ethnic groups respectively (Table I).

Table I. Effect of ethnic group on cesarean section (C- section) delivery rates

Serial no.	Category	Frequency	Percentage (%)
1	Punjabi	76	19.0%
2	Sindhi	68	17.0%
3	Hindko	87	21.8%
4	Balochi	64	16.0%
5	Pathan	104	26.0%
6	Others	1	0.3%
	Total	400	100.0%

EFFECT OF AGE ON CESAREAN SECTION (C- SECTION) DELIVERY RATES

Results showed age variance in C-Section delivery rates. Out of (n=400) deliveries maximum (n=157, 39.25%) of C-Section was found in (26-30 years) age group, whereas (n=109, n=68, n=66) were found in (19-25), (36-40) and (31-35) age groups respectively. The Mean ± Standard Error of Mean was 29.1925 ± .25189 as shown in table 2.

Table II. Effect of age on cesarean section (C- section) delivery rates

Age Groups	Frequency	Percentage (%)	Mean ± SEM
19-25	109	27.25%	29.19 ± 0.25
26-30	157	39.25%	41.23 ± 0.31
31-35	66	16.5%	17.39 ± 0.29
36-40	68	17%	18.56 ± 0.69
Total	400	100%	

Mean ±SEM: Mean and Standard Error of Mean

OCCUPATION

Results showed occupation variances in C-section rates, out of (n=400) deliveries, (n=246, 61.5 %) of C-Section was found in working class and (n=154, 38.5%) was found in non-working class (Table III).

Table III. Occupation variances of C-section patients

Serial no.	Category	Frequency	Percentage (%)
1.	Working	246	61.5%
2.	Housewife	154	38.5%
	Total	400	100.0%

INCOME STATUS OF C-SECTION PATIENTS

The findings of this study showed income variances in C-section delivery rates, out of (n=400) deliveries maximum (n=102, 25.5%) was found in income group 26000 – 35000 rupees & (n=71, 17.75 %) was found in income group (above 106000- 500000 rupees) (Table IV).

Table IV. Income Groups and income status of C-section Patients

Category Income Group (Rupees)	Frequency	Percentage (%)
up to 25000	23	5.75%
26000-35000	102	25.5%
36000-45000	28	7%
46000-55000	11	2.75%

56000-65000	28	7%
66000-75000	31	7.75%
76000-85000	32	8%
86000-95000	25	6.25%
96000-105000	49	12.25%
above 106000-500000	71	17.75%
Total	400	100%
Income Status		
Armed Patients	294	73.5%
Civilian Patients	106	26.5%
Total	400	100%

EDUCATION

The high education of pregnant females is greatly associated with C-section rates because of the frequent visits for antenatal care during their pregnancy. Results of this study showed that out of (n=400) deliveries, most of women were educated such as (n=185, 46.3%) women found with secondary education followed by (n=182, 45.5%) of C-Section was found highly educated and (n=30, 7.5 %) patients got primary education while (n=3, .8 %) of patients were illiterate (Table V).

Table V. Education level distribution of C-section patients

Serial no.	Category	Frequency	Percentage (%)
1	Illiterate	3	0.8%
2	Primary	30	7.5%
3	Secondary	185	46.3%
4	Highly Educated	182	45.5%
	Total	400	100.0%

OBSTETRIC CODE

The findings of this study showed obstetric variances in C-section out of n=400 deliveries maximum n=250 (q1 of C-sections were found in nullipara while n=147 (36.8%) and n=3 (0.8%) were found in multipara and grand multipara respectively (Table VI).

Table VI Obstetric code of C-section patients

Serial no.	Category	Frequency	Percent
1	Nullipara	250	62.5%
2	Multipara	147	36.8%
3	Grand Multipara	3	0.8%
	Total	400	100.0%

GESTATIONAL AGE

Results showed gestational age in C-section, out of n=400 deliveries highest age (weeks) was 36.00 (n=79, 19.8%) of C-section while the lowest frequency (n=4, 1.0%) was found in 34.00 age (weeks) as shown in Table VII.

Table VII. Gestation age (weeks) of C-section patients

Gestational age (weeks)	Frequency	Percentage (%)
34.00	4	1.0%
35.00	58	14.5%
36.00	79	19.8%
37.00	54	13.5%
38.00	64	16.0%
39.00	77	19.3%
40.00	64	16.0%
Total	400	100.0%

CORRELATIONS OBSTETRIC CODE AND GESTATIONAL AGE

Results showed (Table VIII) that out of n=400 C-section deliveries the Pearson Correlation value of obstetric code was (1) and the gestational age was (-.441) showing significant correlation and the p. value was (<0.01).

Table VIII. Correlations between Obstetric Code and gestation age (weeks) of C-section patients

Correlations	Obstetric code	Gestation age
Pearson Correlation	1	-.441**
Sig. (2-tailed)		.000
N	400	400

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

BLOOD PRESSURE

The mean value of blood pressure types such as systolic before C-section, Systolic after C-section, diastolic before C-section, and diastolic after C-section was (122.30, 115.58, 82.61, 75.14 respectively) and the ±SEM was (0.55, 0.40, 0.39. 0.29 respectively) as shown in Table IX.

Table IX. Blood pressure before and after C-section

Blood pressure	Systolic/Diaystolic	±SEM
Blood pressure	Systolic bf	122.30±0.55
before C-section	Diastolic b/f	82.61±0.39
Blood pressure	Systolic aft	115.58±0.40
after C-section	Diastolic aft	75.14±0.29

HEMOGLOBIN LEVEL

Results showed that before (b/f) C-section the mean value of hemoglobin in patients was 12.2958 gm/dl and the SEM was 0.03420 and the mean value of hemoglobin after (aft) C-section was 11.2998 gm/dl and the SEM was 0.0233 as shown in Table X (a).

Table X. (a) Statistical analysis of hemoglobin levels before and after C-section (b) Statistical analysis of blood types and blood sugar levels before and after C-section

(a)	Hemoglobin b/f	Hemoglobin aft
Mean	12.2958	11.2998
Std. Error of Mean	0.03420	0.0233
Average drop in Hb	0.996±0.822 gm/dl	

(b) Blood types and blood sugar levels before and after C-section

	Platelets	WBC	RBC	Blood sugar b/f	Blood sugar a/f
Mean	317765.00	7756.25	4.81	4.85	4.74
Std. Error of Mean	3404.58	67.43	0.02	0.02	0.02
% of Total Sum	100.0%	100.0%	100%	100.0%	100.0%

Table X (b) showed that the mean valve of Platelets, WBC, RBC, Blood sugar before and Blood sugar after was (317765.00, 7756.25, 4.81, 4.85, 4.74) respectively and the SEM for all of them, was (3404.58, 67.43, 0.02, 0.02, 0.02) respectively. These findings are in line with Shearer et al. (14) found that lower metabolic rate lower Blood Sugar levels after C-Section deliveries. El-Radaideh et al. (15) showed that due to spinal anesthesia Blood glucose concentration in patients undergoing elective C-Section decreases.

BODY MASS INDEX

The findings of this study showed the effect of BMI on C-Section Delivery rates. Out of n=400 deliveries maximum (n=198, 49.5%) of C-Section was found in obese patients whereas (n=139, 34.75%) were found in overweight, (n=57, 14.25%) normal weight &(n=6, 1.5%) underweight (Table XI). The findings of this study showed effect of BMI on C-Section delivery rates.

Table XI. Body Mass Index (BMI) of C-section patients

Serial Number	Category	Frequency	Percentage (%)
1	Underweight	6	1.5%
2	Normal weight	57	14.25%
3	Overweight	139	34.75%
4	Obese	198	49.5%

DISCUSSION

Multiple factors have been attributed to the increase in C-sections including socio-demographic characteristics, the type of health facility, maternal health of women and several other obstetric and non obstetric factors Research carried out in India (16) and Bangladesh (17) showed that females belonging to a higher socio-economic class had a higher tendency to opt for caesarean section. In these type of cases, caesarean birth seems to be a desire of woman who can afford it rather than the doctor's referral for a safe childbirth process (18). Moreover, studies conducted in various regions also highlight that caesarean deliveries are more prevalent in mothers belonging to a higher socio-economic class as they have a misconception that caesarean delivery is the highest quality of obstetric care (19, 20). Among socio economic determinants women living in urban areas, having higher education, being rich and richer and had more than 3 visits during pregnancy are more likely to have C-Section (21).

The findings of this study showed ethnic variances in C- section delivery rates. These findings might be comparable with the results of Mattocks et al., (10) who reported the substantial racial and geographic variation in C-section rates among pregnant Veterans receiving obstetrical care but their study did not address the ethnic groups. On the other hand Shearer (14) observed 72% C-sections in Punjabi ethnic group, out of which 80% were living in rural and 20% in urban areas. In this expected direction, caesarean section deliveries are significantly more likely to occur in urban areas as compared to that in rural areas (23).

The age of women at the time of delivery appears as one of the causal factors, as there is a strong association between the age of the mother and the mode of delivery (normal vaginal or caesarean). Numerous researches showed that older women have higher chances of caesarean births. 39.25% of our study subjects having their age between 26-30 years, these findings are in line with the results of Amjad (13), Dorji (24) indicating that the cesarean section rate is high in female over 25 years of age. Rydahl (18) also found that advance maternal age is associated with increased risk of cesarean section. In contrast of the results of Manyeh et al., and Khan et al., (25, 26) who showed that statistically significant increase in the risk of total emergency C-Section in mothers over 35 years of age, compared to that in women less than 30 years old.

Socioeconomic inequalities in C-section rates are well-documented in literature. Another study showed that the cesarean delivery rate was higher among professionals than housewives (27) Results of our study showed occupation variances in C-section rates, out of n=400 deliveries, n=246 (61.5%) of C-sections were found inworking class and n=154(38.5%) was found in non- working class or housewives. This study is in line with Amjad (28) Sarwad (29) showed that the rate of C-section is higher in working woman in Pakistan and they have become more career conscious in terms of getting education and choosing a suitable job during recent years (14). The general concept of becoming economically independent consequences into late marriages of females and, thus, increases the age of woman for conception (30) The increased age of a woman at the time of conception tends to have complications in the later period of the pregnancy that can possibly lead to a caesarean delivery (31). Thus, it could be a most common cause for higher caesarean births compared to normal vaginal births.

Reports showed that caesarean rates were extremely low among the people of very poor countries; at the other extreme C-section deliveries were very high, at least 40% of the population, in rich countries especially in Latin America (32) due to the high monthly income. The findings of our study showed income variances in C-section delivery rates, out of n=400 deliveries maximum n=102 (25.5%) were found in income group of Rs.26000 – 35000 & n=71 (17.75 %) were found in income group of above Rs. 106000- 500000. The

cost of C-section surgeries is relatively higher than the normal vaginal deliveries. The poverty is an essential factor responsible for the low utilization of C-section in women from low-income class group. The results of current studies agree with the findings of Amjad et al., (28) who also assessed income differences and C-Sections were highest among urban mothers. Almeida et al. (32), Khan (26) and Manyeh, (25) also found that patients who belong to the richest wealth quintile were more than 2 times more likely to have C-Section delivery. C-section rate is higher in richest people.

The high education of pregnant females is greatly associated with C-section rates because of the frequent visits for antenatal care during their pregnancy. The outcome of this study agrees with Takegata (33) and Almeida (32) indicating that caesarian section was highest among women with higher education. Education is strongly linked with option of C-section rates as it gives independence and decision making power to the women. These findings imply that women with higher education are most likely to accept C-section than women with lower education status. These findings are not in line with the results of Van Der (27) indicating that women with a primary school degree had a 24% higher risk of C-sesarian delivery than those with a university degree. The educational status of the study subjects of Abeera et al., was ranged from middle (29.6%) to matric (28.7%), the bachelor's degree was held by 12.2% amongst these subjects 72.2% had C-section (14).

Obstetric variances also have impact on C-section deliveries. Globally, nulliparous mothers with singleton term cephalic births constitute 35–43% of the overall C-section rate. The findings of our study showed obstetric variances in C-section. The median caesarian delivery rate after labor induction for nulliparous women with term, single tone, vertex pregnancies was higher comparing multiparous women (28). Whereas, Caesarian section rates among nulliparous women in spontaneous and induce labor were 7.84 % and 32.63%, however, nulliparous women were three to four times more likely to be delivered by caesarean section when labor is induced (29). We observed 62.5% C-section deliveries in nullipara mothers and our findings are in line with the results of Coonrod DV (30) who also assessed that the average nulliparous term singleton vertex Caesarian delivery rate was 22.0%, the lowest hospital rate was 10.3 %, high, 34.2%. Nulliparous women are three to four times more likely to be delivered by caesarean section when labour is induced. In another study, 33.8% cesarean delivery rate was observed for obese nulliparous patients comparing normal nulliparous (control group) which was 20.7% (33).

Our results showed that before (b/f) C-section, the mean value of hemoglobin in patients was 12.2958 gm/dl and the SEM was 0.03420 and the mean value of hemoglobin after (aft) C-section was 11.2998 and the SEM was 11.2998. Average drop in hemoglobin in post operative C-section was 0.996±0.822 gm/dl. The findings of our study showed hemoglobin decrease in C-section deliveries and all patients showed derop in hemoglobin level after C-Section. These findings are in line with Ashwal (36) who showed that the maternal hemoglobin decline following C-delivery. Butwick (35) and Milman (37) also found sever postpartum anemia after C-Section. Singh B et al., 2013 reported that average post-cesarean drop in hemoglobin was 1.52±1.27 gm/dl. Post-operative drop in hemoglobin and haematocrit had weak and positive linear relation with duration between uterine incision and repair (32).

The mean values of platelets, WBC, RBC, Blood sugar before and Blood sugar after was (317765.00, 7756.25, 4.81, 4.85, 4.74) respectively and the ±SEM for all of them, was (3404.58, 67.43, 0.02, 0.02, 0.02) respectively. Shearer et al. 1993 (14) observed the lower metabolic rate showing lower blood sugar levels after C-Section deliveries in majority of cases. Spinal anesthesia also lowers the blood glucose concentration in patients undergoing elective C-Section decreases (38). This periodic decrease in blood glucose level is a physiological process during C-section births which is observed in large number of this type of deliveries. On the other hand, gestational diabetes is another factor related to the C-section deliveries.

The findings of our study showed the effect of BMI on C-Section delivery rates, maximum (C-Section deliveries were observed in obese patients (49.5 %) whereas 34.75 % were found in overweight, 14.25% in normal weight and 1.5% deliveries were observed in underweight mothers. The findings of this study showed effect of BMI on C-Section delivery rates. Significant correlation was observed in BMI and several C-section delivery complications. Obese women undergoing C-section delivery are at higher risk of several C-section delivery complications. Also, they had a longer hospital stay and higher birth weight for

their neonates compared with underweight or non-obese mothers (39). High rate of C-Section was found in women with high BMI (29, 38, 40). Higher BMI was also found to be associated with earlier decisions to perform a C-Section in the second stage of labor. Machado L. S. (40) also found that there was an increased rate of C-delivery as BMI increased. Increased BMI is also associated with other pregnancy complications, including hypertensive disorders and diabetes, furthermore, decreased BMI due to decreased height of mother may leads to C-section.

CONCLUSION

All of our findings and the previous studies suggest that social, economic, professional, and personal factors may have a stronger influence on whether or not a baby is delivered by cesarean than does expected medical benefit or risk

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