Obstetric Safety and Quality at Istishari Arab Hospital: Where Are We Now and How Can We Improve

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ABSTRACT

Background: Indicators for tracking progress in maternal and newborn health have been recommended by a number of global monitoring initiatives. Quality of care is increasingly recognized as an important aspect of maternal and newborn health, particularly in the labor and delivery and immediate postnatal period.

Objectives: The purpose of this study is to estimate the frequency of obstetric complications. Furthermore, in 2018, Istishari Arab Hospital assessed the safety and quality of obstetrical procedures. Identifying risk factors that contributed to adverse events in the obstetric department.

Methods: A retrospective study is dependent on the use of electronic medical records from inpatient hospitals. Research was conducted in the field of inquiry in an electronic database, as well as related studies. Maternal morbidity and adverse outcomes were identified using diagnosis and procedure codes from the International Classification of Diseases, 10th Revision (ICD-10-CM) within the health information system. Aside from the paper files. SPSS was used for descriptive, univariate, and multivariate analysis.

Results This study included 418 women, with 62.2 percent of them having their babies delivered by CS. The average age of the women in this study was 27.84.8 years, with 58.1 percent of them coming from Ramallah. Following a multivariate analysis using logistic regression, our study discovered a positive correlation with P-value 0.05 between educational level and prior CS on one side and surgical site infection on the other. Furthermore, our study found a link between the rate of CS on one side and maternal age, diabetes, hypertension, and gynecological factors on the other (prematurity, multiple gestation).

Conclusion: Regardless of the number, patients with a lower education level or a history of CS have a higher risk of surgical site infection and other complications. By focusing on these factors and increasing awareness and education, we may be able to reduce obstetric complications in the future.

Keywords: Cesarean section, Istishari Arab Hospital, obstetric, Palestine, surgical site infection.

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I. Introduction

Nowadays, the quality of health care has emerged as a critical policy issue on a global scale. The Institute of Medicine (IOM) defines healthcare quality as "the extent to which health services for individuals and populations increase the likelihood of desired health outcomes while remaining consistent with current professional knowledge" [1]. The same Institute of Medicine captures the most important aspects for quality improvement in its report 'Crossing the Quality Chasm' by providing six specific quality aims/dimensions (Safe, Effective, Patient Centered, Timely, Efficient, and Equitable) [1].

The first dimension/goal for healthcare quality is patient safety. Patient safety, according to Charles Vincent, is the avoidance, prevention, and amelioration of adverse outcomes or injuries resulting from the healthcare process [2]. Patient safety is becoming more important as the healthcare system becomes more complex. Every day, the researcher witnesses a series of tragic patient harms that highlight the need to make healthcare safer. The problem has a large global impact, with many thousands of people being harmed and a large amount of money being wasted because of unsafe medical care [3]. Patient harm and death are not the only consequences of unsafe healthcare. A growing body of evidence indicates that unsafe healthcare results in lost productivity, prolonged hospital stays, and disability, all of which are costly to society [1]. There are numerous studies and reports available

worldwide that discuss the harm and cost of unsafe medical care from various countries [4]-[7]. As a result, measuring the level of safety and identifying the factors that influenced patient safety is critical to enhancing improvement. Safety is the responsibility of everyone working in the health system. It is not the only responsibility of clinicians but also the organizational responsibility [1]. Understanding errors is essential for designing initiatives that will prevent and reduce system errors. An error is defined in safety literature as "an act of commission (doing something wrong) or omission (failure to do the right thing) that results in an unfavorable outcome" [8]. Events of harm, on the other hand, are clearly clinical outcomes; they are especially likely to engage both clinicians and administrators in a thorough review of the system factors that led to the adverse event causing this harm, with a clear focus on improving patient outcomes [9]. Various methods for estimating patient safety indicators can be used to assess the level of patient safety. Each method has advantages and disadvantages, which best described in Thomas and Peterson study [10].

Maternal health and wellbeing are a global health priority. It had been an integral part of the Millennium Development Goals (MDGs) and has continued to be a fundamental part of the Sustainable Development Goals (SDGs) that were adopted by more than 150 leaders from around the globe [11]. The concerns of obstetric safety increased recently due increased number of caesarean deliveries recently despite WHO recommendation in 1985 that the rate of C-section not to exceed "5% to 15%"of total deliveries and according to the medical necessity [12]-[16]. Caesarean deliveries require the use of more medical and health care resources than natural births, making it a real burden on health systems with limited budgets [14]. The childbirth accounts for the largest category of hospital admissions and as a result, the quality of the health institutions and hospitals serving these populations are of special importance as they are directly related to the maternal as well as the neonatal outcomes. Maternal health issues, mainly childbirth safety and unintended complications that are caused by health care management rather than the patient's disease, represent recently a significant challenge in healthcare. During childbirth, potential adverse events may arise can affect both mother and baby. Moreover, these adverse events or complications have a direct effect on the healthcare costs due to in-patients' disability, death or prolong hospitalization.

Most of the maternal morbidities and costs related to medical management are Caesarean section wound infection, 3rd and 4th degree of laceration due to vaginal delivery (with or without instrument), and Neonatal injury [17]-[21]. Obstetric complications found to be a global issue. There many studies worldwide that discus all types of delivery and complications related to them [22]-[27].

Surgical site infections after CS are preventable complications but impose a significant burden in terms of patient morbidity and mortality and increase the cost of treatment [28], [29]. Looking at the factors associated with the SSI, the increase in number of caesarean deliveries leads to increase rate of SSI and it the most significant factor associated with it. Surgical site infections (SSIs) are defined as infections that occur at or near a surgical incision within

30 days of the operation or after one year or more if the examination is not well [30].

Regarding the pregnancy-related deaths, many studies proved that several interventions can be done that are directly associated with the provider (clinical care), the system (functioning of the health care system) and the patient herself to reduce obstetric associated adverse effects [31], [32]. To assess the quality of healthcare in the obstetric department, several indicators can be used. Caesarean section rates (the process) and the size of the unit are widely used and are considered among the most important indicators to be measured [33]-[35]. In addition to previous, maternal mortality rate is one of the quality measurement indicators that still an important indicator and used as a tool for national and international comparisons, with third and 4th degree laceration is the most common complication associated with it [36]-[39].

Caesarean delivery has a special concern as the rate has increased dramatically in addition to decrease in the rate of vaginal delivery worldwide over the past century [40]-[43]. Operative vaginal delivery, using either vacuum or forceps, is considered an alternative to caesarean delivery in case of maternal medical benefit from shortening the second stage of delivery or maternal exhaustion. However, despite its benefits, operative vaginal delivery is associated with both maternal and neonatal adverse outcomes [44], [45]. Recently in USA, trends for operative vaginal delivery have decreased with decrease in its rate [46]-[49].

According to the Palestinian Ministry of Health's 2017 annual health report, childbirth rates in Palestine were 136,349 in 2017, with 78,046 born in the West Bank, accounting for 57.2 percent of all births, and 58,303 born in the Gaza Strip, accounting for 42.8 percent of all reported births. In 2017, the proportion of home births in Palestine was only 0.1 percent of the total number of births. According to the Palestinian Ministry of Health, C-sections accounted for 60% of all patients in private hospitals in 2017. These statistics provided an impression of the significance of delivery and the complications that can arise as a result of it [50], [51]. Several articles on obstetric safety and quality have been published worldwide. Unfortunately, there are no studies on this topic in the West Bank. Palestine.

The purpose of this study is to estimate the incidence and type of obstetric complications, as well as the safety and quality of obstetrical procedures, among women who delivered at Istishari Arab hospital in 2018.

II. MATERIAL AND METHODS

A. Study Area/Setting

The study was conducted in the labor section of Istishari Arab Hospital. The IAH Hospital is the largest private hospital in the West Bank, which was established aiming to serve Palestinian community and to be the alternative referral hospital in West Bank. In addition to that, IAH recently decides to work on getting the Joint Commission International (JCI) certificate in order to improve patient safety and quality of health care through the provision of education, publications, advisory services, international accreditation, and certification.

B. Data Collection

To assess maternal morbidity associated with obstetrical care, the Agency for Healthcare Research and Quality (AHRQ) developed a list of obstetric patient safety indicators. Based on the HIS dataset, the researcher identified six adverse outcomes (patient harm) that can be coded. Four of these outcomes are associated with obstetric discharges:

a) 3rd and 4th-degree lacerations for vaginal delivery (with or without instrument)
b) Caesarean section delivery
c) Surgical site infection after C-Section
d) Maternal readmission within 48 hours due to SSI.

Adapting the selected indicators to the Palestinian hospitals

Indicator sets were evaluated, reviewed, and adapted for use in the Palestinian context. In order to explain the terms used and the exclusion criteria, some terms and notes were added to the indicator definitions. All data that could be extracted from the EMR were reviewed, but some information was missing, such as the pregnant woman's weight, education, employment, and city. The majority of the missing information was obtained from midwives' paperwork records. The following variables were obtained from patient records: length of stay (LOS), time of delivery (start and end time) Maternal age, maternal medical conditions, obstetrical history, current obstetrical complications, medication type, and epidural for vaginal deliveries are all factors to consider.
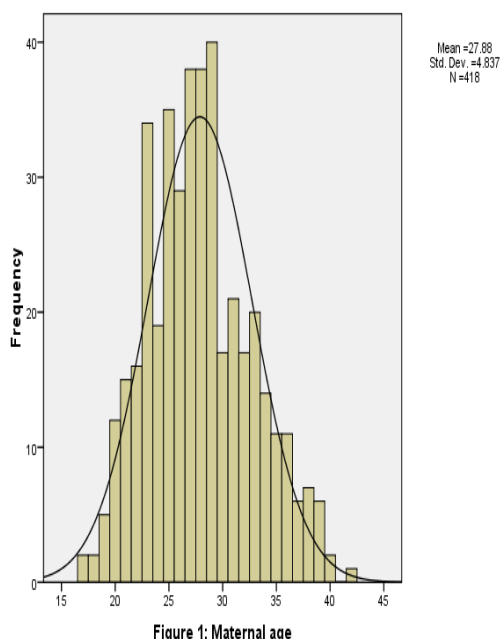

Fig.1. Histogram presents the participant's maternal age.

C. Ethical Considerations

Because this is a retrospective chart review study, informed consent is not required. No identifiers or personal information, including participants' names, IDs, and other information, were collected or stored, ensuring complete privacy and confidentiality. The use of HIS data was approved by responsible authorities at IAH hospital and AAUP.

III. RESULTS

Out of 418 total sample, the majority of women 247(59.1%) were from Ramallah city, followed by women from Jericho 40 (9.6%) and Hebron 40 (9.6%). Very few women were from Qalqelia, Tubas and Gaza (3 (0.7%), 2 (0.5%), and 1(0.2%) respectively). For more details follow Table I.

All women were married, and the average age of women participated was 27.8±4.8 years old and ranged between 17 to 42 years old and most (67%) of them between 25 to 35 years old. Regarding women education level and work, most of women had bachelor degree education but most of them (71.1%) were not working and only 28.9 were working. For more details see Table I and Fig. 1.

TABLE I: DEMOGRAPHIC CHARACTERISTICS OF WOMEN

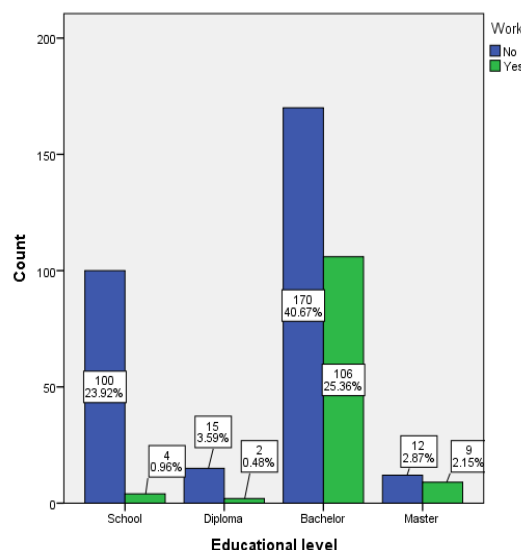| Variable		Frequency	Percent
Residency	Ramallah	247	59.1
	Hebron	40	9.6
	Jericho	40	9.6
	Nablus	29	6.9
	Jerusalem	23	5.5
	Tulkarem	11	2.6
	Jenin	8	1.9
	Salfit	8	1.9
	Bethlehem	6	1.4
	Qalqilia	3	0.7
	Tubas	2	0.5
	Gaza	1	0.2
Maternal Age (years)	Mean= 27.8	Min=17	Max= 42
Work	No	297	71.1
	Yes	121	28.9
Educational Level	Elementary	4	1.0
	Secondary	100	23.9
	Diploma	17	4.1
	Bachelor	276	66.0
	Master	21	5.0

Fig. 1. The distribution of level of education and working status among mothers.

The following histogram (Fig. 2) presents the distribution of mothers' age. Most of them were between the age of 25 years and 35 years. Very few cases were below the age of 20

years or above the age of 40 years. For more details see Fig. 1.

Although most mothers are educated and more than 70 percent of them have bachelor's degrees or more, most of them do not work, especially among mothers who have a diploma or less. On the other hand, most working mothers have had a bachelor's degree or more. For more details see Fig. 2.

Two hundred sixty 62.2% (260) of the women in this study delivered through CS and almost 38% delivered by normal vaginal delivery. In terms of maternal history, 13.6% of the women had multiple gestations, and approximately 65% of our studied population had a previous one birth.

As for premature labour 25% of women were exposed to that experience. Assisted vaginal birth with instrument was not exceeding 2% of the total number of births, while vaginal childbirth using epidural was almost 11%. Nearly 74% of women did not undergo a previous caesarean section operation. For more details see Table II.

TABLE II: GYNAECOLOGICAL HISTORY OF MOTHERS

		Frequency	Percent
Multiple gestation	No	358	85.6
	Yes	57	13.6
Number of deliveries	0	150	35.9
	1	123	29.4
	2	82	19.6
	3	37	8.9
	4	14	3.3
	5	5	1.2
	6	6	1.4
	7	1	0.2
Premature labor with delivery	No	313	74.9
	Yes	105	25.1
Type of delivery	CS	260	62.2
	Normal	158	37.8
Epidural for vaginal deliveries	No	373	89.2
	Yes	45	10.8
Vaginal delivery with instrument	No	409	97.8
	Yes	9	2.2
Prior cesarean section	No	159	38.0
	Yes	259	62.0
Number of CS	0	308	73.7
	1	72	17.2
	2	28	6.7
	3	7	1.7
	4	1	0.2

TABLE III: MEDICAL HISTORY

		Frequency	Percent
Diabetes mellitus	No	407	97.4
	Yes	10	2.4
Hypertension	No	402	96.2
	Yes	15	3.6

Regarding the medical profile of recruited women, most women did not have diabetes or high blood pressure. Only 2.4% and 3.6% of women had a history of diabetes and hypertension respectively. For more details see Table III.

With regards to other complications and outcomes, the prevalence of surgical site infection was almost 2%, third to fourth laceration was 15%, and readmission was 2%. The length of stay varies between women. Most of women (97.8%) stayed less than three days in hospital, 1.7% of them stayed 3 days in hospital and only one woman (0.2%) stayed 7 days in hospital. The prevalence of large for gestational age) baby weight more than 4000 g) was 13.2 %. For more details see Table IV.

TABLE IV: COMPLICATIONS

		Frequency	Percent
Surgical site infection	No	410	98.1
	Yes	8	1.9
3rd or 4th degree lacerations	No	354	84.7
	Yes	63	15.1
Readmission within 48 hours	No	410	98.1
	After 9 Days	8	1.9
Length of stay	1	161	38.5
	2	248	59.3
	3	7	1.7
	12	1	0.2
Large of Gestation Age (LGA)	No	361	86.4
	Yes	55	13.2

1) Bivariate and multivariate analysis: Cesarean section and surgical site infection

To quantify the patient's characteristics and its effect on quality outcomes (surgical site infections), bivariate analysis was carried out. Then, multivariate analysis was conducted with the covariates. Significance level was considered on the level P-value < 0.05.

B. Bivariate Analysis

1) Caesarean section and women demographic, medical history and gynaecological variables

Two hundred sixty (62.2%) of the women participated in this study delivered through CS. By analysing the relationship between demographic variables and previous medical history with caesarean delivery, the researcher found the coming results. Maternal age, diabetes and hypertension variables had positive statistically significant correlation with caesarean section. The educational level had negative statistically significant correlation with caesarean section. Other demographic variables (residency and work) have no statistically significant correlation with caesarean section. For more details see Table V.

TABLE V: CORRELATIONS OF WOMEN DEMOGRAPHIC AND MEDICAL HISTORY VARIABLES WITH CAESAREAN SECTION BY BIVARIATE ANALYSIS

Variable		Maternal Age	Residency	Educational Level	Work	DM	HTN
Ceserean Section	Correlation Coefficient	0.179**	-0.048	-0.098*	-0.007	0.124*	0.099*
	P Value	<0.001	0.291	0.045	0.879	0.012	0.043
	Total	418	418	418	418	417	417

DM: Diabetes mellitus; **HTN**: Hypertension; **CS**: Caesarean section **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Moreover, positive statistical correlations (P-value < 0.05) were found between caesarean delivery and some gynecological factors as, number of caesarean sections, prior Caesarean section, multiple gestation, and premature labor.

On the other hand, other gynecological variables (ex. number of deliveries) have no statistically significant correlation with caesarean section. For more details see Table VI.

TABLE VI: CORRELATIONS OF WOMEN GYNAECOLOGICAL VARIABLES WITH CAESAREAN SECTION BY BIVARIATE ANALYSIS

Variable		Number of Deliveries	Number of CS	Prior CS	Multiple Gestation	Premature Labor
Cesarean Section	Correlation Coefficient	-0.007	0.427**	0.995**	0.282**	0.252**
	P Value	0.882	<0.001	<0.001	<0.001	<0.001
	Total	418	416	418	415	418

CS: Caesarean section **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

2) Surgical site infection and women demographic, medical history and gynaecological variables

TABLE VII: DEMOGRAPHIC VARIABLE & MEDICAL HISTORY OF WOMEN WITH SURGICAL SITE INFECTION BY BIVARIATE ANALYSIS

		Surgical Site Infection		%	X^2	P
		No	Yes			
Residency	Ramallah	243 (58.1%)	4 (1.0%)	1.6	17.83	0.206
	Hebron	39 (9.3%)	1 (0.2%)	2.5		
	Jericho	40 (9.6%)	0 (0.0%)	0.0		
	Nablus	28 (6.7%)	1 (0.2%)	3.4		
	Jerusalem	23 (5.5%)	0 (0.0%)	0.0		
	Tulkarem	9 (2.2%)	2 (0.5%)	18.2		
	Jenin	8 (1.9%)	0 (0.0%)	0.0		
	Salfit	8 (1.9%)	0 (0.0%)	0.0		
	Bethlehem	6 (1.4%)	0 (0.0%)	0.0		
	Qalqilia	3 (0.7%)	0 (0.0%)	0.0		
	Tubas	2 (0.5%)	0 (0.0%)	0.0		
	Gaza	1 (0.2%)	0 (0.0%)	0.0		
Educational Level	School	101 (24.2%)	3 (0.7%)	3.0	10.72	0.013*
	Diploma	15 (3.6%)	2 (0.5%)	11.8		
	Bachelor	273 (65.3%)	3 (0.7%)	1.1		
	Master	21 (5.0%)	0 (0.0%)	0.0		
Work	No	290 (69.4%)	7 (1.7%)	2.4	1.07	0.447
	Yes	120 (28.7%)	1 (0.2%)	0.8		
Diabetes Mellitus	No	399 (95.7%)	8 (1.9%)	2.0	0.200	0.654
	Yes	10 (2.4%)	0 (0.0%)	0.0		
HTN	No	394 (94.5%)	8 (1.9%)	2.0	0.304	0.581
	Yes	15 (3.6%)	0 (0.0%)	0.0		
Total		409 (98.1%)	8 (1.9%)	1.9		

* Significance is declared at alpha less than 0.05.

At the Bivariate level, the associations revealed that educational level of mothers had a statistical significance relationship with surgical site infection (r= 0.14, *p*= 0.004). Other demographic variable had no statistical significance relationship with surgical site infection.

Regarding the gynecological variables of mothers) number of caesarean and prior caesarean)had a statistical significance relationship with surgical site infection (r= 0.10, p= 0.04 & r=0.10, p= 0.025 respectively). Other gynecological variable had no a statistical significance relationship with surgical site infection. Moreover, medical history variables had neither statistical significance nor correlation with surgical site infection (*p* > 0.05).

By looking to the educational level of mothers, the researcher found a statistical significance relationship with surgical site infection; the occurrence of surgical site infection was highest among diploma and school age (14.8%) comparing with bachelor and master's degree (1.1%).

Although other demographic variables had no statistical significance relation with surgical site infection, but the occurrence of surgical site infection was higher among non-working (2.4% vs 0.8%), or resident in Tulkarm area (18.2%).

Regarding medical history, the occurrence of surgical site infection was higher among non-diabetic women (2.0% vs 0.0%), and non-hypertensive women (2.0% vs 0.0%). For more details see Table VII.

Mothers who had a prior caesarean section had a statistical significance relationship with surgical site infection; the occurrence of surgical site infection was highest among diploma and school age (14.8%) comparing with bachelor and master's degree (1.1%).

Although other demographic variables were not significantly associated with surgical site infection, the occurrence of surgical site infection was higher among women with previous CS (3.1% vs. 0.0%). Moreover, number of previous caesarean section was marginally significant with occurrence of surgical site infection.

Other gynecological variables had no statistical significance with surgical site infection but women with multiple gestation, delivered vaginally with instrument, and delivered with epidural had low rate of surgical site infection (0.0%, 0.0%, and 0.0 % vs. 2.2%, 2.0%, and 2.1% respectively). Furthermore, the occurrence of surgical site infection was higher with women who had premature labour (2.9% vs. 1.9%). For more details see Table XI.

Although the educational level of mothers had statistically significant relation at univariate analysis, but at the multivariate level, it did not have a statistical significance relation with surgical site infection. Educated mothers,

employed, and long duration of labor were less likely to develop surgical site infection. Women with higher number of deliveries, premature labor, and longer length of stay were more likely to develop surgical site infection. For more details see Table VIII.

TABLE VIII: PARTICIPANT'S DEMOGRAPHIC, MEDICAL HISTORY AND GYNECOLOGICAL VARIABLES WITH SURGICAL SITE INFECTION BY LOGISTIC REGRESSION

	B	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Maternal Age	-0.085	0.802	0.370	0.919	0.764	1.106
Residency	0.265	3.466	0.063	1.304	0.986	1.724
Level of Education	-0.435	1.098	0.295	0.647	0.287	1.460
Work	-0.138	0.124	0.725	0.871	0.404	1.879
Duration of Labor	-0.368	2.164	0.141	0.692	0.424	1.130
Number of Deliveries	0.309	1.228	0.268	1.362	0.789	2.353
Premature Labor Delivery	0.169	0.711	0.399	1.184	0.800	1.752
Length of Stay	0.439	2.74	0.098	1.55	0.920	2.60

* Significance is declared at alpha less than 0.05.

Diabetic mothers had statistically significant relation at univariate analysis and multivariate level; it did have a statistical significance relation with undergoing caesarean section. Educated mothers and women with higher number of deliveries were less likely to undergo caesarean section. Diabetic and hypertensive women were more likely to undergo caesarean section. For more details see Table IX.

TABLE IX: PARTICIPANTS DEMOGRAPHIC, MEDICAL HISTORY AND GYNAECOLOGICAL VARIABLES WITH UNDERGOING CAESAREAN SECTION BY LOGISTIC REGRESSION

	B	Wald	Sig.	Exp(B)	95.0% C.I .for EXP(B)	
					Lower	Upper
Maternal age	0.104	18.653	0.000**	1.109	1.058	1.163
Residency	-0.019	0.378	0.539	0.981	0.922	1.043
Level of education	-0.227	3.221	0.073	0.797	0.621	1.021
Work	-0.030	0.136	0.713	0.970	0.826	1.140
HTN	0.392	0.928	0.335	1.479	0.667	3.283
DM	10.017	6.37	0.012*	2.241	0.56	0.650
Duration of Labor	-0.009	0.112	0.738	0.991	0.938	1.046
Number of Deliveries	-0.274	6.235	0.013*	0.760	0.613	0.943

* Significance is declared at alpha less than 0.05.
** Significant correlation is declared at alpha less than 0.01 level.

IV. DISCUSSION

The goal of this retrospective study was to assess the quality and safety level of the obstetric department, as well as the relationship between different demographic and gynecological variables on one hand, and delivery-associated complications in terms of surgical site infection and vaginal lacerations on the other.

The study findings are discussed in this chapter in relation to other literature and previous studies. Following that, the researcher discusses the dissertation's potential strengths and theoretical contributions. In addition, the limitations of the study designs were evaluated. Then we talk about the overall conclusion. Finally, we conclude this chapter by discussing the significance and implications for practice and health policy, as well as making recommendations for future research and practice.

The average age of the women who participated in this study was 27.84.8 years old. The majority of them (67%) were between the ages of 25 and 35. According to our data, 74% of the women in this study had at least one previous CS, which exceeds the WHO recommendation for the globally accepted CS rate (19 percent of total births). Globally, CS rates have increased, resulting in an increase in the number of diseases, abnormalities, maternal mortality, and the risk of uterine loss [55]. In the Betrán et al. [21] study, a global study about the increasing rate of cesarean deliveries, the highest rate of CS was found in Latin America, the Caribbean, with a rate of 40.5 percent.

The study reported an increase in the rate of CS between (1990-2014) from 22.8 % to 40.5%. And showed different rates of CS in different continent as the following: Northern America (32.3%), Oceania (31.1%), Europe (25%), Asia (19.2%) and Africa (7.3%) [53]. our study reported much higher rate of CS (62%) comparing to the international literature. Possible explanation that IAH hospital receives complex cases from all areas where the last solution is caesarean delivery, or some cases were births twin, the position of the fetus plays a role in determining the type of birth, some diseases related to maternal health or child health request Caesarean section intervention, the lack of expansion in women with the presence of pain request for the birth of caesarean section.

Regarding the significant positive association between advanced maternal age and the rate of CS. Our results were in line with a cohort study in London 2013. The results of that study showed that advanced maternal age is a risk factor for miscarriage, pre-eclampsia, SGA, GDM and Caesarean section, but not for stillbirth, gestational hypertension, spontaneous preterm delivery or LGA [56].

When we compared our findings to those of other studies, we discovered that the positive correlation of CS on one side and diabetes mellitus and hypertension on the other side was similar. Obesity and diabetes mellitus (Type I, II) both increased the rate of CS in the United States, according to [57]. Hedderson discovered that maternal cardiometabolic risk factors (hyperglycemia, pre-existing hypertension, and a high BMI) were independently linked to an increased risk of primary cesarean delivery. Effective strategies to increase the proportion of women entering pregnancy at an optimal weight with normal blood pressure and glucose before pregnancy could potentially eliminate up to 20% of cesarean deliveries [58]. Good management of DM and hypertension is highly recommended in order to reduce the rate of CS and its complication. Moreover, continuous education and awareness on management of DM and hypertension during the pregnancy might have an impact on reducing CS option.

In line with other studies, we found a significant positive association between CS rate and some gynecological factors (Number of Cesarean sections, Prior Cesarean section, multiple gestation, and premature labor) [59], [60].

Coming to the surgical site infection, we found a statistical significance relationship between surgical site infection (SSI) and number of CS & prior CS (r= 0.10, p= 0.04 & r=0.10, p= 0.025 respectively). Our results were close to those reported previously [61]. Hence, attention should be given to take care

of those patients who have more risk to develop SSI. A strong significant relationship was found between the educational level and the presence of previous history of cesarean delivery on one hand and the incidence of surgical site infections on the other hand. Our study revealed that the educational level of mothers had a statistically significant correlation with SSI (r = 0.14, p = 0.004). The lower the level of education, the greater incidence of SSI. This is in line with the World Health Organization, where they noted that the level of education for women affected the understanding of the caesarean section output and how to prevent and care for the wound after the operation [62]. Using tools (forceps but not the suction, 2%) to remove the fetus was similar to those studies conducted in other healthcare setting [50].

The incidence of infection at the surgical site was higher but not significant among non-diabetic women (2.0% vs. 0.0%), and non-hypertensive women (2.0% vs. 0.0%), suggesting no direct correlation between chronic disease and infection. This is in line with the study conducted by England in 2013 and in another study conducted in Cuba in 2014 that showed that diabetes and blood pressure are indirectly related to infection [28].

In our study, we discovered that lacerations are one of the complications that affect 15% of the women in this study. Lacerations are another common postpartum complication. Lacerations are common following a vaginal birth. Trauma to the cervix, vagina, and vulva, including the labial, periclitoral, and periurethral regions, as well as the perineum, can occur. The majority of these lacerations have no negative functional consequences. Although less common, severe perineal lacerations that extend into or through the anal sphincter complex are more commonly associated with an increased risk of pelvic floor injury, fecal and urinary incontinence, and pain, and sexual dysfunction with symptoms that may persist or be present many years after giving birth [62].

V. CONCLUSION

Our study is the first study in West Bank (Palestine) to present information about obstetric safety and quality. Our study has a conclusion of the increasing rate of CS in women with increased age, previous medical history of DM or HTN, or women with some gynecological factors (number of previous cesarean section, multiple gestation, or premature labor). Moreover, we conclude that an increased rate of surgical site infection and other obstetrical complications in women with a state of less education level in comparing with women with high education level, or in the state of women with the previous history of CS regardless of the number. Focusing on these factors and increase awareness and education, might support reducing obstetric complication in the future.

REFERENCES

[1] Donaldson MS, Corrigan JM, Kohn LT. Institute of Medicine. To err is human: building a safer health system. 2000.
[2] Vincent C. Incident reporting and patient safety. *BMJ.* 2007; 334(7584): 51-51.
[3] World Health Organization. Summary of the evidence on patient safety: implications for research.
[4] Lancet T. Patient safety: too little, but not too late. *Lancet (London, England).* 2019; 394(10202): 895.
[5] Wilson RM, Michel P, Olsen S, Gibberd RW, Vincent C, El-Assady R, et al. Patient safety in developing countries: retrospective estimation of scale and nature of harm to patients in hospital. *BMJ.* 2012;344.
[6] Levinson DR, General I. Adverse events in hospitals: national incidence among Medicare beneficiaries. Department of Health and Human Services Office of the Inspector General. 2010.
[7] Hoonhout LH, de Bruijne MC, Wagner C, Zegers HW, Waaijman R, Spreeuwenberg P, VU Research Portal. *BMC Health Services Research.* 2009; 9: 27.
[8] Silverman RD. Understanding Patient Safety: Robert M. Wachter (McGraw-Hill, New York, New York, 2008), 313 pages, $34.95.
[9] Griffin FA, Resar RK. IHI global trigger tool for measuring adverse events. 2009.
[10] Thomas EJ, Petersen LA. Measuring errors and adverse events in health care. *Journal of General Internal Medicine.* 2003; 18(1): 61-7.
[11] World Health Organization. The H4+ partnership joint support to improve women's and children's health: progress report 2014.
[12] Howell EA, Zeitlin J, Hebert P, Balbierz A, Egorova N. Paradoxical trends and racial differences in obstetric quality and neonatal and maternal mortality. *Obstetrics and Gynecology.* 2013; 121(6): 1201.
[13] Kung A, Pratt SD. Patient safety in obstetrics and obstetric anesthesia. *International Anesthesiology Clinics.* 2014; 52(2): 86-110.
[14] Byers BD, Betancourt A, Lu F, Hankins GD, Longo M, Saade GR, et al. The effect of prepregnancy obesity and sFlt-1–induced preeclampsia-like syndrome on fetal programming of adult vascular function in a mouse model. *American Journal of Obstetrics and Gynecology.* 2009; 200(4): 432-e1.
[15] Pettker CM, Grobman WA. Obstetric safety and quality. *Obstetrics & Gynecology.* 2015; 126(1): 196-206.
[16] Najjar S, Hamdan M, Euwema MC, Vleugels A, Sermeus W, Massoud R, et al. The Global Trigger Tool shows that one out of seven patients suffers harm in Palestinian hospitals: challenges for launching a strategic safety plan. *International Journal for Quality in Health Care.* 2013; 25(6): 640-7.
[17] Nielsen PE, Goldman MB, Mann S, Shapiro DE, Marcus RG, Pratt SD, et al. Effects of teamwork training on adverse outcomes and process of care in labor and delivery: a randomized controlled trial. *Obstetrics & Gynecology.* 2007; 109(1): 48-55.
[18] Pratt SD, Mann S, Salisbury M, Greenberg P, Marcus R, Stabile B, et al. Impact of CRM–based team training on obstetric outcomes and clinicians' patient safety attitudes. *Joint Commission Journal on Quality and Patient Safety.* 2007; 33(12): 720-5.
[19] Bhutta ZA, Darmstadt GL, Haws RA, Yakoob MY, Lawn JE. Delivering interventions to reduce the global burden of stillbirths: improving service supply and community demand. *BMC Pregnancy and Childbirth.* 2009; 9(1): 1-37.
[20] Forster AJ, Fung I, Caughey S, Oppenheimer L, Beach C, Shojania KG, et al. Adverse events detected by clinical surveillance on an obstetric service. *Obstetrics & Gynecology.* 2006; 108(5): 1073-83.
[21] Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR. The increasing trend in caesarean section rates: global, regional and national estimates: 1990-2014. *PloS One.* 2016; 11(2): e0148343.
[22] Geubbels E. Epidemiology of maternal mortality in Malawi. *Malawi Medical Journal.* 2006; 18(4): 208-28.
[23] Monjurul H. Incidence of Obstetric and Foetal Complications during Labor and Delivery at a Community Health Centre, Midwives Obstetric Unit of Durban, South Africa. *ISRN Obstetrics and Gynecology.* 2011; 2011.
[24] Jurdi R, Khawaja M. Caesarean section rates in the Arab region: a cross-national study. *Health Policy and Planning.* 2004; 19(2): 101-10.
[25] Roldán E, Grajeda LM, Pérez W. Maternal height associated with cesarean section. A cross-sectional study using the 2014–2015 national maternal-child health survey in Guatemala. *International Journal for Equity in Health.* 2020; 19(1): 1-9.
[26] Villar J, Valladares E, Wojdyla D, Zavaleta N, Carroli G, Velazco A, et al. Caesarean delivery rates and pregnancy outcomes: the 2005 WHO global survey on maternal and perinatal health in Latin America. *The Lancet.* 2006; 367(9525): 1819-29.
[27] Monjurul H. Incidence of Obstetric and Foetal Complications during Labor and Delivery at a Community Health Centre, Midwives Obstetric Unit of Durban, South Africa. *ISRN Obstetrics and Gynecology.* 2011; 2011.
[28] Haque M, Sartelli M, McKimm J, Bakar MA. Health care-associated infections–an overview. *Infection and Drug Resistance.* 2018; 11: 2321.

[29] Vallejo MC, Attaallah AF, Shapiro RE, Elzamzamy OM, Mueller MG, Eller WS. Independent risk factors for surgical site infection after cesarean delivery in a rural tertiary care medical center. *Journal of Anesthesia.* 2017; 31(1): 120-6.

[30] Geller SE, Cox SM, Callaghan WM, Berg CJ. Morbidity and mortality in pregnancy: laying the groundwork for safe motherhood. *Women's Health Issues.* 2006; 16(4): 176-188.

[31] World Health Organization. Trends in maternal mortality: 1990-2015: estimates from WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. World Health Organization; 2015.

[32] El Arifeen S, Hill K, Ahsan KZ, Jamil K, Nahar Q, Streatfield PK. Maternal mortality in Bangladesh: a Countdown to 2015 country case study. *The Lancet.* 2014; 384(9951): 1366-74.

[33] Draycott T, Sibanda T, Laxton C, Winter C, Mahmood T, Fox R. Quality improvement demands quality measurement. *BJOG: An International Journal of Obstetrics & Gynaecology.* 2010; 117(13): 1571-4.

[34] Collins KJ, Draycott T. Measuring quality of maternity care. *Best Practice & Research Clinical Obstetrics & Gynaecology.* 2015; 29(8): 1132-8.

[35] Miller S, Abalos E, Chamillard M, Ciapponi A, Colaci D, Comandé D, et al. Beyond too little, too late and too much, too soon: a pathway towards evidence-based, respectful maternity care worldwide. *The Lancet.* 2016; 388(10056): 2176-92.

[36] Mann S, Pratt S, Gluck P, Nielsen P, Risser D, Greenberg P, et al. Assessing quality in obstetrical care: development of standardized measures. *The Joint Commission Journal on Quality and Patient Safety.* 2006; 32(9): 497-505.

[37] Miller S, Abalos E, Chamillard M, Ciapponi A, Colaci D, Comandé D, et al. Beyond too little, too late and too much, too soon: a pathway towards evidence-based, respectful maternity care worldwide. *The Lancet.* 2016; 388(10056): 2176-92.

[38] Danel I, Berg C, Johnson CH, Atrash H. Magnitude of maternal morbidity during labor and delivery: United States, 1993–1997. *American Journal of Public Health.* 2003; 93(4): 631-4.

[39] Quinlan JD, Murphy NJ. Cesarean delivery: counseling issues and complication management. *American Family Physician.* 2015; 91(3): 178-84.

[40] Menacker F. *Recent trends in cesarean delivery in the United States.* US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. 2010.

[41] Quinlan JD, Murphy NJ. Cesarean delivery: counseling issues and complication management. *American Family Physician.* 2015; 91(3): 178-84.

[42] Gregory KD, Jackson S, Korst L, Fridman M. Cesarean versus vaginal delivery: whose risks? Whose benefits?. *American Journal of Perinatology.* 2012; 29(01): 07-18.

[43] Merriam AA, Ananth CV, Wright JD, Siddiq Z, D'Alton ME, Friedman AM. Trends in operative vaginal delivery, 2005–2013: a population-based study. *BJOG: An International Journal of Obstetrics & Gynaecology.* 2017; 124(9): 1365-72.

[44] American College of Obstetricians and Gynecologists. Operative vaginal delivery. *ACOG Practice Bulletin.* 2000.

[45] Friedman AM, Ananth CV, Prendergast E, D'Alton ME, Wright JD. Evaluation of third-degree and fourth-degree laceration rates as quality indicators. *Obstetrics & Gynecology.* 2015; 125(4): 927-37.

[46] Obstetric trauma rate—vaginal delivery with instrument: technical specifications. *Patient Safety Indicators No. 18.*

[47] Obstetric trauma rate—vaginal delivery without instrument: technical specifications. *Patient Safety Indicators No. 19*

[48] Elixhauser A, Pancholi M, Clancy CM. Using the AHRQ quality indicators to improve health care quality. *Joint Commission Journal on Quality and Patient Safety.* 2005; 31(9): 533-8.

[49] Action CT. Quality Patient Care in Labor and Delivery: A Call to Action.

[50] Timmel J, Kent PS, Holzmueller CG, Paine L, Schulick RD, Pronovost PJ. Impact of the Comprehensive Unit-based Safety Program (CUSP) on safety culture in a surgical inpatient unit. *The Joint Commission Journal on Quality and Patient Safety.* 2010; 36(6): 252-60.

[51] Kitabayashi H, Chiang C, Al-Shoaibi AA, Hirakawa Y, Aoyama A. Association between maternal and child health handbook and quality of antenatal care services in Palestine. *Maternal and Child Health Journal.* 2017; 21(12): 2161-8.

[52] Joint Commission. Facts about Joint Commission International.

[53] Namessi W. The public perception of AI affecting the sports industry.

[54] Diab M, Veronese G, Jamei YA, Kagee A. Risk and Protective Factors of Tramadol Abuse in the Gaza Strip: The Perspective of Tramadol Abusers and Psychiatrists. *International Journal of Mental Health and Addiction.* 2020: 1-7.

[55] Molina G, Weiser TG, Lipsitz SR, Esquivel MM, Uribe-Leitz T, Azad T, et al. Relationship between cesarean delivery rate and maternal and neonatal mortality. *Jama.* 2015; 314(21): 2263-70.

[56] Khalil A, Syngelaki A, Maiz N, Zinevich Y, Nicolaides KH. Maternal age and adverse pregnancy outcome: a cohort study. *Ultrasound in Obstetrics & Gynecology.* 2013; 42(6): 634-43.

[57] Ehrenberg HM, Durnwald CP, Catalano P, Mercer BM. The influence of obesity and diabetes on the risk of cesarean delivery. *American Journal of Obstetrics and Gynecology.* 2004; 191(3): 969-74.

[58] Hedderson MM, Xu F, Sridhar SB, Han ES, Quesenberry CP, Crites Y. A cohort study of maternal cardiometabolic risk factors and primary cesarean delivery in an integrated health system. *Plos One.* 2018; 13(7): e0199932.

[59] Monson M, Silver RM. Multifetal Gestation: Mode of Delivery. *Clin Obstet Gynecol.* 2015; 58(3): 690-702.

[60] Lorthe E, Quere M, Sentilhes L, Delorme P, Kayem G. Incidence and risk factors of caesarean section in preterm breech births: A population-based cohort study. *European Journal of Obstetrics & Gynecology and Reproductive Biology.* 2017; 212: 37-43.

[61] Zejnullahu VA, Isjanovska R, Sejfija Z, Zejnullahu VA. Surgical site infections after cesarean sections at the University Clinical Center of Kosovo: rates, microbiological profile and risk factors. *BMC infectious Diseases.* 2019; 19(1): 1-9.

[62] Wildman K, Bouvier-Colle MH, MOMS group. Maternal mortality as an indicator of obstetric care in Europe. *BJOG: An International Journal of Obstetrics & Gynaecology.* 2004; 111(2): 164-9.