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Association of Cesarean Delivery with Occurrence of Placenta Previa

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Abstract: *This study was **aimed** to assess association of cesarean delivery with occurrence of placenta previa. **Design**: Cross section design was utilized. **Setting:** The study was carried out at high risk unit at Mansoura University Hospital. **Subjects:** A purposive sample carried out for 139 pregnant women who were selected according to the inclusion criteria. **Tool:** Structured Interviewing Schedule. **Results**: The incidence of placenta previa among pregnant women with history of previous cesarean delivery was 100.00%. More than half of studied women had previous history of three and more cesarean delivery. There was highly statistically significant relation between the number of previous cesarean delivery and the types of placenta previa. There was statistically significant relation between the number of previous cesarean delivery and abnormal placental adhesion. **conclusion**: The study concluded that there was highly association between cesarean delivery and occurrence of placenta previa. **Recommendation:** Increase awareness of the women about the risks of elective cesarean delivery and the health benefit of birth spacing between every birth trough continuous health education.*

***Keywords**: cesarean delivery, Placenta previa.*

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I. Introduction

Caesarean delivery (CD) is the most common surgery done in the world as a life-saving surgical procedure when certain complications appear during pregnancy and delivery or expected to occur during this period. It has several indications as maternal indications which include previous cesarean section, failed induction, prolonged labor, elderly primigravida, cephalo-pelvic disproportion, cervical dystocia and complications of pregnancy such as(preeclampsia, oligohydramnios, placenta praevia, placental abruption, presence of cardiac disease) or other maternal pathologies. Fetal indications which include precious infant, malpresentation &malposition, fetal distress, macrosomia, IUGR and multiple fetuses ***(Mylonas and Friese, 2015; Burke et al., 2017)***.

Moreover, C-section procedures are used more frequently than is necessary in some countries as it accounts for over 25% and over 32% of all deliveries annually in the UK and USA respectively. while in Egypt, general rate of delivery by CD elevated dramatically from 27.6% in 2010 to 52% in 2014, so governments and health organizations promote programs to reduce the use of C-section in favor of vaginal delivery. WHO states no additional health benefit associated with CD if its rate goes above 10–15% and it recommends that they should be done based only on medical need ***(Naeem et al., 2015; WHO, 2015).***

Although it is a major surgery, it is exposed to short and long term health consequences that affect mothers and their infants, as a scarred uterus poses risks to all future pregnancies and deliveries. (***Navaee and Abedian, 2015; Oliveira et al., 2016).*** CD involve surgical and anesthesia-related risks, and may have long-term effects such as placenta previa, placenta accrete**,** endomyometritis , thromboembolism, which may often lead to maternal death ***(Zakerihamidi et al., 2015; Seal et al., 2016)***

Placenta previa is an obstetric complication in which the placenta is implanted partially or wholly in the lower uterine segment ***(Bakker et al., 2016***). It is one of the leading cause of vaginal bleeding in the 3rd trimester and a major cause of maternal and perinatal morbidity and mortality**.** Moreover the incidence of PP is 0.5-0.1% and this increase because of rising rate of cesarean section, advanced maternal age on delivery, multiparity, prior abortion ***(Hasan, 2014; Thabet et al., 2017).***

Significance of the study

World Health Organization reported that the cesarean delivery rates differ from 5-25% during the last

20 years which was different at the national and international levels as well. For example, the cesarean delivery rate, was 32.7% of all United States births in 2013, and the overall rate of delivery by cesarean delivery was 52% in Egypt , 65% in Gharbia and 65.5% in Dakahliya in 2014 ***(Fuglenes et al., 2011; El-Zanaty and Way, 2015; Martin et al., 2015).*** Also the rate of cesarean delivery at Mansoura University Hospital was 47.25% in 2013 ***(Helal et al., 2013).***

Moreover the incidence of placenta previa has been recently estimated to be approximately 0.5-1% of all pregnancies, and this increase correlated to the elevated cesarean delivery rate ***(Gurol-Urganci et al., 2011; Bhargava and sinha, 2013; Downes et al., 2015)***. Placenta previa is a major cause of maternal morbidity and mortality (accounting for 25% of all direct maternal deaths) because of the associated massive antepartum and intrapartum hemorrhage (***Daskalakis et al., 2011).***

Study aim

The current study aimed to assess association of cesarean delivery with occurrence of placenta previa.

Study questions

I. Is previous cesarean delivery risk factor for occurrence of placenta previa?
II. What is the incidence of placenta previa associated with previous cesarean delivery?

II. Subjects and Method

Study design

Cross section design was utilized.

Study setting

The study was carried out at high risk unit at Mansoura University Hospital.

Study sample

The study included 139 pregnant women recently diagnosed placenta previa selected according to the following inclusion criteria.

- Multiparous women who were diagnosed with placenta previa.
- Accept to participate in the study.
- Free from mental & psychiatric illness.

Tool of Data Collection

Tool I: Structured Interviewing Schedule

It was developed by the researcher after reviewing the related literature. It was involved three parts to measure the following:

Part I: General characteristics of pregnant women such as (age, educational level, occupation, residence).

Part II: Obstetrical data such as (gravidity, parity, number of miscarriage, gestational age, Inter pregnancy interval, previous mode of delivery, indication and number of previous cesarean delivery, previous placenta previa).

Part III: Ultrasonography report for the participants such as(number of fetus, viability, lie, presentation, fetal heart rate, types of placenta previa, placental localization, abnormal placental adhesions, liquor, sex of fetus, gestional age).

The Preparatory Phase:

After extensive review of literature, the instruments mentioned above were carefully elected. Preparatory phase lasted two months from July 2016 till the end of September 2017.

Development of Study Tools Validity

Tools used in the study were prepared by the researcher after rereading of local and international related literatures. This helped to be familiar with the problem and directed in the process of designing the tool. Tools were revised by 3 jury from specialists in maternity nursing field tested the content validity.

Reliability

All items of the tool were tested and analyzed for reliability by using Cronbach's α (alpha) and found to be 0.764.

The Pilot Study Phase:

Pilot study phase was conducted at high risk unit at Mansoura University Hospital on ten percent of the sample size (14 women with PP) for one month (October 2016) to test the applicability of the research tools & the clarity of the designed items and the required modifications were made. The pilot sample was omitted from the study sample.

Ethical considerations

- An official permission was taken from research ethics committee of the Faculty of Nursing, Mansoura University.
- An official permission was obtained from the director of Mansoura University Hospital and head of obstetrics and gynecology department to conduct the study after clarifying the study aim.
- Prior to the study, oral consent was accomplished from every women involved in the study & after explanation of the nature purpose of the study .
- The participants were informed that participation is voluntary and they have the right to refuse or withdraw from the study at any time.
- Anonymity, privacy, confidentiality &safety of the collected information was absolutely assured throughout the whole study as the tool was given code number instead of taking woman's name.

Field work

This study was actually carried out in a period from October 2016 to March 2017. Data were collected from high risk unit at Mansoura University Hospital after obtaining the written approval from the director to conduct the study. the researcher introduced herself to the head of obstetrics and gynecology department at Mansoura University Hospital, took written permission to conduct study after clarification of the study aim. The researcher introduced herself to women, took oral consent of them to be included within the study after clarification of study aim. The researcher interviewed each woman individually for 20-25 minutes. During the interview, the researcher read every item in the sheet of data collection & simplified its meaning to the woman. Women were allowed to ask for any interpretation, elaboration or clarification. The researchers attended the previously mentioned setting four days per week from 9 a.m. to 2 p.m until the calculated sample size of a pregnant women was obtained.

III. Statistical Design

The collected data by questionnaires and tools coded, tabulated and analyzed using statistical package of social sciences(SPSS) version 20 (SPSS, Chicago, IL). All data were categorical data and were expressed in number and percentage. The differences between two groups or more were determined using chi-square test. Statistical significance was set at $p<0.05$.

IV. Results

Part (I): General Characteristics of Study Sample

Table (1): *Socio demographic Characteristics among Pregnant women (n=139).*

Items	No. (n=139)	%
Age		
18-23 years	2	1.4
24-29 years	37	26.6
30-35 years	54	38.8
> 35 years	46	33.1
Range	18-40	
Mean±SD	32.4±5.2	
Residence		
Rural	80	57.6
Urban	59	42.4
Educational level		
Illiterate	39	28.1
Middle education	50	36.0
High education	50	36.0
Occupational status		
House wife	131	94.2
Employed	8	5.8

Table (1) shows the frequency distribution of socio demographic characteristics among studied pregnant women. It showed that less than three quarter of pregnant women with PP(72%) aged 30 years old and more with mean age (32.4±5.2). In addition to (57.6%) of pregnant women came from rural origin. Concerning educational level, the results revealed that more than one third of women had middle and high education (36.0%). Also the majority of women were housewives (94.2%).

Part (II): Associated risk factors of placenta previa among pregnant women

Table (2): Obstetrical History among Pregnant Women (n=139).

Items	No. (n=139)	%
Gravidity		
2	24	17.3
3	31	22.3
>3	84	60.4
Parity		
1	30	21.6
2	31	22.3
3	34	24.5
>3	44	31.7
Miscarriages		
None	83	59.7
1	24	17.3
2	10	7.2
>2	22	15.8
Inter pregnancy interval		
<1 year	8	5.8
1-2 years	78	56.1
> 2 years	53	38.1
History of twin pregnancy	22	15.8
Mode of delivery		
Cesarean	119	85.6
Vaginal and cesarean	20	14.4
Number of previous cesarean delivery		
One	36	25.9
Two	31	22.3
Three	34	24.5
> three	38	27.3
Previous placenta previa		
No	95	68.3
One	36	25.9
Two	8	5.8
Preterm Labor		
No	123	88.5
Yes	16	11.5

Table (2) illustrates the frequency distribution of obstetric history among studied pregnant women. It showed that nearly two thirds of women with PP(60.4%) were multigravida. As regard history of previous abortion, it was obvious that less than half(40.3%) of studied women had history of miscarriage. In addition to (56.1%) became pregnant within (1-2 yrs) from previous delivery. More than half of studied women had previous history of three and more cesarean section (51.8%). Regarding history of previous placenta previa it present in nearly one third of studied women(31.7%).

Figure (1): Incidence & frequency distribution of types of placenta previa among pregnant women (n=139).

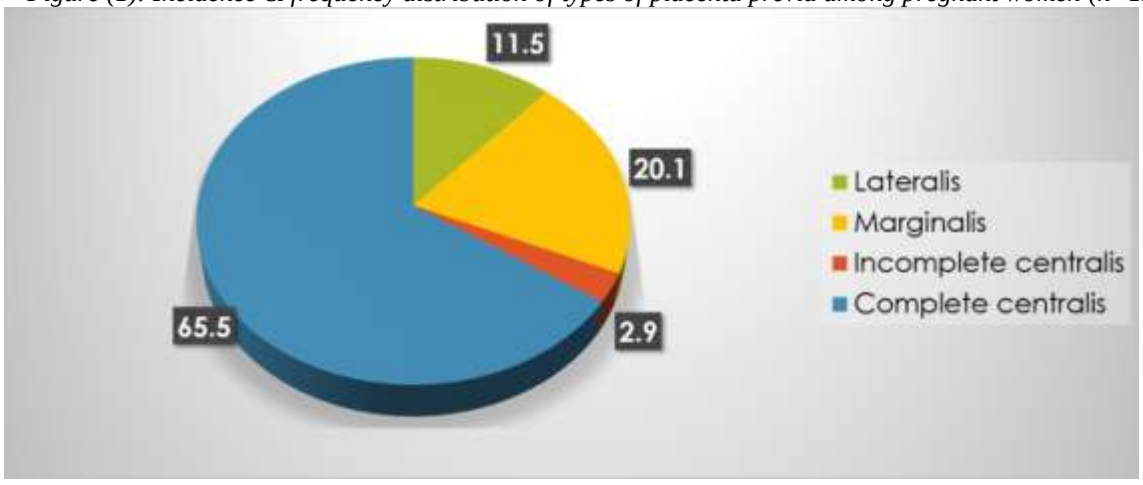

Figure (1) illustrates that the total incidence of placenta previa among pregnant women with previous history of cesarean delivery was (100.00%). It also represents types of placenta previa among pregnant women. It was evident that complete centralis PP was the most common degree, with the highest percentage (65.5%), followed by marginalis (20.1%) and low lying (11.5%). The least degree was incomplete centralis (2.9%).

Table (3): *Association between the number of parity with types of placenta previa, localization and abnormal adhesion (n=139).*

Items	*Parity*								*Chi square test*	
	1		*2*		*3*		*>3*			
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*X2*	*P*
Types of Placenta previa										
Lateralis	4	13.3%	2	6.5%	6	17.6%	4	9.1%		
Marginalis	16	53.3%	6	19.4%	4	11.8%	2	4.5%		
Incomplete centralis	2	6.7%	0	0.0%	0	0.0%	2	4.5%		
Complete centralis	8	26.7%	23	74.2%	24	70.6%	36	81.8%	38.011	<0.001
Placental localization										
Anterior	14	46.7%	23	74.2%	26	76.5%	32	72.7%		
Posterior	16	53.3%	8	25.8%	8	23.5%	12	27.3%	8.435	0.038
Abnormal placental adhesions										
No	26	86.7%	13	41.9%	18	52.9%	24	54.5%		
Accrete	4	13.3%	16	51.6%	10	29.4%	16	36.4%		
Increta	0	0.0%	0	0.0%	4	11.8%	0	0.0%		
Percreta	0	0.0%	2	6.5%	2	5.9%	4	9.1%	27.832	<0.001

Table (3): shows association between the number of parity with types of placenta previa & abnormal adhesion. It was evident that there was highly satistically significant relation between the number of parity and the types of placenta previa & abnormal adhesion (P=<0.001 respectively).

Table (4): *Association between the number of previous cesarean section with types of placenta previa, localization and abnormal adhesion (n=139).*

Items	*Number of CS*								*Chi square test*	
	One		*Two*		*Three*		*>three*			
	No	*%*	*No*	*%*	*No*	*%*	*No*	*%*	*X2*	*P*
Types of Placenta previa										
Lateralis	6	16.7	2	6.5%	6	17.6%	2	5.3%		
Marginalis	18	50.0%	6	19.4%	2	5.9%	2	5.3%		
Incomplete centralis	2	5.6%	0	0.0%	0	0.0%	2	5.3%		
Complete centralis	10	27.8%	23	74.2%	26	76.5%	32	84.2%	41.830	<0.001
Placental localization										
Anterior	18	50.0%	23	74.2%	28	82.4%	26	68.4%		
Posterior	18	50.0%	8	25.8%	6	17.6%	12	31.6%	9.174	0.027
Abnormal placental adhesions										
No adhesion	26	72.2%	19	61.3%	16	47.1%	20	52.6%		
Accrete	10	27.8%	10	32.3%	12	35.3%	14	36.8%		
Increta	0	0.0%	0	0.0%	4	11.8%	0	0.0%		
Percreta	0	0.0%	2	6.5%	2	5.9%	4	10.5%	18.672	0.028

Table (4): shows association between the number of previous CS with types of placenta previa, localization & abnormal adhesion. It was evident that there was highly satistically significant relation between the number of previous CS and the types of placenta previa (P=<0.001). Also there was significant relation between the number of previous CS and localization & abnormal adhesion (P=0.027, P=0.028 respectively).

Table (5): *Association between the interval among pregnancies with types of placenta previa, localization and abnormal adhesion (n=139).*

Items	*interval between pregnancies*						*Chi square test*	
	<1 year		*1 – 2 years*		*> 2 years*			
	No	*%*	*No*	*%*	*No*	*%*	*X2*	*P*
Types of Placenta previa								
Lateralis	0	0.0%	8	10.3%	8	15.1%		
Marginalis	4	50.0%	22	28.2%	2	3.8%		
Incomplete centralis	0	0.0%	4	5.1%	0	0.0%		
Complete centralis	4	50.0%	44	56.4%	43	81.1%	21.110	0.002
Placental localization								
Anterior	4	50.0%	48	61.5%	43	81.1%		
Posterior	4	50.0%	30	38.5%	10	18.9%	6.920	0.031
Abnormal placental adhesions								
No adhesion	2	25.0%	54	69.2%	25	47.2%		
Accrete	4	50.0%	22	28.2%	20	37.7%		
Increta	0	0.0 %	0	0.0%	4	7.5%		
Percreta	2	25.0%	2	2.6%	4	7.5%	19.162	0.004

Table (5): shows association between the interval among pregnancies with types of placenta previa, localization & abnormal adhesion. Results showed that there was satistically significant relation between the interval among pregnancies and the types of placenta previa, localization & abnormal adhesion (P=0.002, P= 0.031, P=0.004 respectively).

V. Discussion

The current study aimed to assess association of cesarean delivery(CD) with occurrence of placenta previa(PP). The results of this study answered the study questions and revealed that cesarean delivery is the most important risk factor for occurrence of placenta previa and the frequency of placenta previa increased as the number of cesarean delivery increased. Regarding incidence of PP associated with previous cesarean delivery, the current study revealed that the incidence of PP associated with pervious CD was (100.00%). The high incidence in the study is due to the high incidence of caesarean section rate.

Concerning general characteristics of pregnant women, the present study revealed that less than three quarter of pregnant women with PP (72%) aged 30 years old and more. These study findings were in consistent with ***Rahim et al. (2014)*** who study risk factors associated with major placenta previa in Pakistan and reported that more than two thirds of studied women (69%) were 30 years old or above in their study. Also ***Maiti et al. (2014).*** Found that advanced maternal age of >30 years was clearly associated with PP in their study about risk factors of placenta previa among rural Indian women. This may be due to the percentage of sclerotic changes on intra myometrial arteries increased with increasing age, thereby reducing blood supply to the placenta.

In contradict to these findings ***Wandabwa et al. (2008)*** who study to determine the risk factors for placenta praevia presenting with severe vaginal bleeding in Mulago hospital, Kampala, Uganda reported that three quarter of studied women (75%) in their study were below the age of 30 years. This may be due to presence of other contributing factors as previous cesarean scar or large size of placenta.

Concerning occupation the current study found that the majority of women were housewives. This finding in disagreement with ***Hung et al .(2007)*** who study risk factors for placenta previa in an Asian population found that the independent risk factors for placenta previa included working during pregnancy as it is possible that women with physical or psychological stress are predisposed to placental implantation in the lower uterine segment or to a lesser likelihood of placenta previa resolution as the gestation advances.

Regarding obstetrical history among pregnant women, the current study clarified that nearly two thirds of women with PP were multigravida (60.4%). This finding was supported by ***Senkoro et al. (2017)*** who study in Northern Tanzania about frequency, risk factors, and adverse fetomaternal outcomes of placenta previa and found that multigravida more than five times connoted a fivefold increase in the risk of PP.

Also ***Hafeez et al. (2014)*** reported in their study about the prevalence of placenta previa, obstetrical risk factors and fetomaternal complications at Sharif Medical City that most of the study sample (92%) were multigravida. The increased risk of placenta previa among multigravida women may be due to degenerative change of the uterine vasculature leading to under perfusion of the placenta, compensatory enlargement, and increased likelihood of implantation on the lower segment.

Moreover the current study findings revealed that more than half of pregnant women had three and more parity. This finding in agreement with ***Shaikh (2014)*** who conducted her study in Pakistan to assess frequency of placenta previa in multigravida and found that multiparity has been linked as a well-known independent risk factor for developing of placenta previa. As women of parity greater than four the frequency of placenta previa(PP) was 10.1% compared to 6.7% in primiparous.

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Also ***Ezzat et al. (2015)*** reported that parity is an additional risk factor of PP as more than three quarter of study sample (80.59%) were multiparous &(4.47%) were grand multiparous in their study about incidence of placenta previa at Aswan university hospital.

These findings are in contrast with recent researches carried out ***Senkoro et al. (2017)*** and ***Kaur et al. (2015)*** who investigated incidence, risk factors and neonatal outcomes of placenta previa presenting as antepartum hemorrhage in tertiary care center of north India, found that parity was not risk factor in their study. This may be related to different culture and life style habits.

As regard history of previous abortion, the present study findings revealed that less than half of studied women had history of miscarriage. Consistent with the current study findings ***Rahim et al. (2014)*** who concluded that previous history of miscarriage was strongly associated with placenta previa occurence. contradictory results reported by ***Wandabwa et al. (2008)*** who mentioned that abortion was not risk factor in their study.

concerning history of previous placenta previa, the results revealed that nearly one third of studied women(31.7%) have previous history of PP. This finding was supported ***by Mustafa et al. (2017)*** who revealed that more than one third of the pregnant women(37.9%) had previous history of PP in their study about incidence and risk factors of placenta praevia in Najran University hospital. Meanwhile Contradictory results mentioned by ***(Maiti et al., 2014; Rahim et al. (2014); Gargari et al., 2016).***

Moreover Woman with previous caesarean section or uterine scar are at the highest risk of developing PP. Multiple studies have confirmed 2– 5 fold increased risk of PP development with previous caesarean section. This risk further escalates with increasing number of cesarean delivery. The current study showed that previous CD was the highest identifiable risk factor of PP as more than half of studied women had previous history of three and more CD .

These findings were in consistent with ***Halimi (2011)*** who study association of placenta previa with multiparity and previous cesarean section in Pakistan, stated that the chance of PP in women increasing with prior cesarean delivery as women with two or more prior cesarean delivery were more likely to have a placenta previa than those without CS. Moreover ***Ahmed (2016)*** who study prevalence and risk factors of placenta previa in Saudi Arabia and Sudan stated that previous CS is an important risk factor for the development of placental complications as the incidence of PP 1.86% after one CS , 5.49% after two CS and as high as 14.28% after three CS. Another study showed that the maximum numbers of cases with placenta previa were reported after previous I and Previous II lower segment cesarean section i.e. 30.35% and 35.7%respectively ***(Afshan et al., 2013*)**.

Moreover ***Ahmed (2012),*** study in Zagazig about risk factors and pregnancy outcome of placenta previa reported that, more than two thirds of women with PP had previous history of CS. The reasons for occurence of PP after previous CS is damage and scarring of the uterus during CS. This is predisposing to low implantation of the placenta. However the damage during lower segment caesarean section is not much and may not be the only explanation. The other explanation is attraction and adherence of the placenta to the caesarean section scar. Also the scarring of the uterus may retard the physiological development of the lower uterine segment. These interfere with the placental migration with the upper segment as the pregnancies grow .

The current study revealed that there was highly satistically significant relation between the number of parity and the types of placenta previa & abnormal placental adhesion. This finding was in consistent with ***Halimi (2011)*** who reported that the relation between parity and types of placenta previa was highly significant. Also, another study conducted about pregnancy complicated by placenta previa by ***Kruszyński and Bręborowicz (2013)*** showed that a significant increase ($p < 0.05$) of complete placenta previa incidence is observed in relation to increasing parity. This may be due to advanced maternal age or repeated CS.

In the contrary ***Bahar et al. (2009)*** found that there were no significant relation between the number of parity and the major PP &minor PP and ***Kaur & Kaur (2012)*** who investigated obstetric complications: primiparity Vs. multiparity in India supported the same finding .

The current study evaluated the association between the number of previous CS with types of placenta previa and abnormal adhesion. The study findings revealed that there was highly significant relation between the number of previous CS and the types of placenta previa and abnormal adhesion .

Such findings are supported by ***Zeba et al. (2016)*** who study risk analysis of placenta previa in subsequent pregnancy with history of cesarean section in Faridpur medical college hospital and concluded that the incidence of morbidly adherent placenta increased dramatically over the last three decades with the increased in cesarean delivery numbers and there was significant relation between the number of CS and the types of placenta previa as most of women with previous cesarean section present with type III and central placenta previa.

In addition ***(Bashir and Jadoon (2012); Kruszyński and Bręborowicz (2013))*** revealed that there was significant increase of complete placenta previa incidence with increasing number of prior CS deliveries.

Moreover ***Mustafa et al. (2017)*** reported that association of placenta previa types with previous caesarean section was found to be significant p-value (0.017) and the probability of a pregnancy been complicated by placenta previa and placenta accreta increases dramatically with the number of prior CD.

Regarding association between the interval among pregnancies with types of placenta previa and abnormal adhesion. Study findings revealed that there was significant relation between the interval among pregnancies and the types of placenta previa & abnormal adhesion.

These finding in agreement with ***Gurol-Urganci et al. (2011)*** in their study about the risk of placenta previa in second birth after first birth cesarean section in England who found that there was significant relation between birth interval and types of placenta previa as very short birth interval of less than one year and birth intervals of more than four years increased the incidence of placenta previa occurence.

Also, ***Getahun et al. (2006)*** conducted study to examine the association between cesarean delivery and previa & abruption in subsequent pregnancies stated that short interpregnancy interval is strongly associated with increased risks of previa and increased risk of abnormally adherent placent (placenta accreta, increta, and percreta). This is may be due to the maternal depletion theory as pregnancy is a physiologically demanding condition to the mother that may lead to depletion of stored nutritional elements. Also pregnancy with a short (interpregnancy) interval may deprive the mother from restoring those nutritional elements needed to support a normal pregnancy and full recovery of the internal lining of the uterus. Meanwhile ***Roberts et al. (2012)*** reported that there were no relation between birth interval and types of placenta previa in their study about trends and recurrence of placenta praevia in Australia.

VI. Conclusion

Based on the present study findings, the following can be concluded:

Overall the findings of the present study highlighted that there was highly association between cesarean delivery and occurrence of placenta previa**.**

VII. Recommendations

Based on the results of this study, the following were recommended:

- Increase awareness of the women about the risks of elective cesarean delivery and the health benefits of birth spacing between every birth through continuous health education .
- Improve the knowledge and awareness within graduated nurse about how to provide care, close monitoring to women with placenta previa. This could be achieved through: lectures workshops, seminars, training course.
- Further researches are needed to increase knowledge of the women about adverse effect of postponing motherhood which increased the risk of placenta previa.

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Conflicts Of Interests

The authors state that there is no conflict of interests regarding this study.

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