

## Prevalence rate, perinatal outcome and causes of obstructed labour A hospital based study

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### Abstract

**Background and objective:** Obstructed labor is a serious intrapartum emergency especially seen in women deprived of modern healthcare delivery. It could be one of the major reasons of morbidity and mortality for both the mother and the newborn. This study was aimed at determine the rate, causes and perinatal outcomes of women who have obstructive labor during delivery.

**Methods:** A cross-sectional study that was conducted on 150 delivering women having obstructed labor at Maternity Teaching Hospital, Erbil city, Kurdistan Region, Iraq from 1<sup>st</sup> of March 2021 to 1<sup>st</sup> of March 2022 The rate, socio-demographic characters (age, parity, smoking, antenatal care, residency, education level, gestational age), causes like (malposition, malpresentation, cephalo-pelvic disproportion) and perinatal outcomes were recorded.

**Results:** of 9137 labor, 150 were obstructed labor; the total rate was 1.6% during the period of the study. There was no statistically significant associated between socio-demographic characters like age, smoking, gestational age, residency, education level, antenatal care and obstructed labor except multiparity that has significant association. There was a significant association between the causes like cephalo-pelvic disproportion, malposition, malpresentation, sized baby and having fracture to spine and pelvis or trauma and obstructed labor. Also there was no statistically significant associated between Apgar score and admission to neonatal intensive care unit.

**Conclusion:** Obstructive labor is common during labor. Malposition was most common the cause of obstructive labor and parity has association with it too. Neonatal morbidity and mortality are dependent on the type of presentation.

**Keywords:** Obstructed labor; Perinatal outcomes; Malpresentation; Intrapartum; Antenatal care.

### Introduction

Obstructed labor is a serious intrapartum emergency especially seen in deprived populations of modern healthcare delivery.<sup>1</sup> Obstructed labor could be one of the major reasons of morbidity and mortality for both the mother and the baby if it is neglected.<sup>2</sup> Labor is considered obstructed when the presenting part of the fetus cannot progress into the birth canal, despite the strong uterine contractions.<sup>3</sup> Cephalo-pelvic disproportion is the most

frequent cause of obstructed labor.<sup>3</sup> Pelvic tumors, malposition, or malpresentation are other causes of obstructed labor.<sup>3</sup> Occipito-posterior position of the head of the fetus and ineffective contractions of the uterus can also be associated with difficult labor.<sup>4</sup> Indifferent developing countries there are different ratios of obstructed labor oscillating between 2 to 8% while it escalates up to 12% in Africa.<sup>5</sup> There are controversy regarding demographic characteristics associated

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with obstructive labor. Studies done in Pakistan and Ethiopia show that demographic characters are highly associated with the occurrence of obstructed labor.<sup>5</sup> while in Africa and India there was low relation with obstructive labor.<sup>5,6</sup> If an obstructed labor is neglected it could result in birth asphyxia followed by meconium aspiration syndrome, sepsis, admission to NICU, damage to the brain with long term neurological problems, or maybe even death.<sup>6</sup> When a pregnancy is complicated by obstructed labor, there will be different frequencies of perinatal outcomes.

A study in Sudan showed a rate of 26.2% of stillbirth and 9.5% of early neonatal death while in Nigeria the rates were 23% for stillbirth and 6.7% for early neonatal death.<sup>7</sup> The majority of studies that were done on obstructive labor were conducted in hospitals where the health care system and culture are different from that of our community. Data on the prevalence rate and factors that are associated with obstructive labor in Maternity Teaching Hospital in Erbil city are necessary to provide baseline data, which could help in the planning of interventions to improve the obstructive labor in our locality. According to knowledge, this study is regarded the first to be conducted in Maternity Teaching Hospital to determine the rate of obstructive labor, perinatal outcomes and probable causes.

## Methods

This cross-sectional study was carried out on women with obstructed labor at the Maternity Teaching Hospital in Erbil city, Kurdistan Region, Iraq. during study period the inclusion criteria were the delivering women of any parity, age 18 years and more, gestational age equal or more than 37week, any fetal presentation and fetal position were accepted to participate in the study. Exclusion criteria were any women refused to participate. All of the information about the women in the study sample was collected using a questionnaire form for the

study that was completed in a face-to-face interview.

Obstructed labor was defined as unsuccessful descent of the fetus's presenting part through the birth canal regardless of the strong uterine contractions. All women during the study period were followed up in labor. Women were categorized at the end of labor to groups with obstructed labor and non-obstructed labor. Pelvic and abdominal examination was done to find out any signs of head molding, caput, liquor status (amniotic fluid), and cervical dilatation as a constituent of routine labor follow-up.

Fetal vital signs and heart sound were also measured. All information was recon. Once obstructed labor was diagnosed in the 1<sup>st</sup> stage of labor during routine follow up, its causes were documented.

An inconsistency between the size of the baby's head and that of the mother's pelvis was defined as known as cephalo-pelvic disproportion.<sup>8</sup> Any type of fetal presentation except vertex was considered as malpresentation while malposition was defined as cephalic presentation during delivery which was not occipito-anterior.<sup>8</sup>

The women gave birth either vaginally or by emergency cesarean section, typically due to protracted 2<sup>nd</sup> stage of labor or failure to evolve in the 1<sup>st</sup> stage of labor. Gestational age was determined depending on the first trimester ultrasound. After delivery the birth weight was categorized >2.500-<4000 grams and less than 2.500 grams.<sup>9</sup> when a baby is born with no signs of life completing 24 weeks of pregnancy, it was considered as stillbirth.<sup>10</sup> Following the delivery of these women data were recorded about all the neonates in relation to Apgar score, birth weight, gender, presence of any frank congenital anomalies, admission to neonatal intensive care unit and fetal viability. Apgar scores were collected 1 minute and 5 minutes post-delivery and were grouped as 0-3 (depressed severely), 4-6 (depressed moderately), and 7-10 (excellent).<sup>11</sup> Neonates whose Apgar score

was <6 were admitted to the NICU. They were followed up after delivery for about a week and adverse outcomes were documented on the chart of follow-up of labor.

#### **Ethical consideration**

Ethical approval to conduct this study was approved by Research ethics committee/ Hawler Medical University/ college of medicine (approval number 8, 23 of May 2021). Verbal informed consent have to documented on writing and signed by the participants and not verbally obtained from each woman. An official acceptance letter was obtained from the Erbil Directorate of Health granting permission to conduct this research at the hospital. All participants were assured that confidentiality would be maintained and that their information would only be used for research purposes.

#### **Statistical analysis**

Data were analyzed using statistical package for social sciences (SPSS Version 22). Proportions are compared using chi-square test. In a table whose twenty percent of its cell's expected count is <5, Fischer's exact test is applied. Statistical significance was defined as a *P* value of ≤0.05.

### **Results**

Out of 9137 deliveries that were registered during the period from march 2021 to March 2022, a total 150 obstructed labour cases were selected and enrolled in this study/making the rate 1.6%. The mean age of these women was 27.1±5.9 years. Primiparous involved (67), (44.7 %) and exactly half of them were multiparous women. Regarding the educational level, the majority were of low educational levels. More than half (92), (61.3%) were living in urban areas, and (8), (5.3%) were smokers.

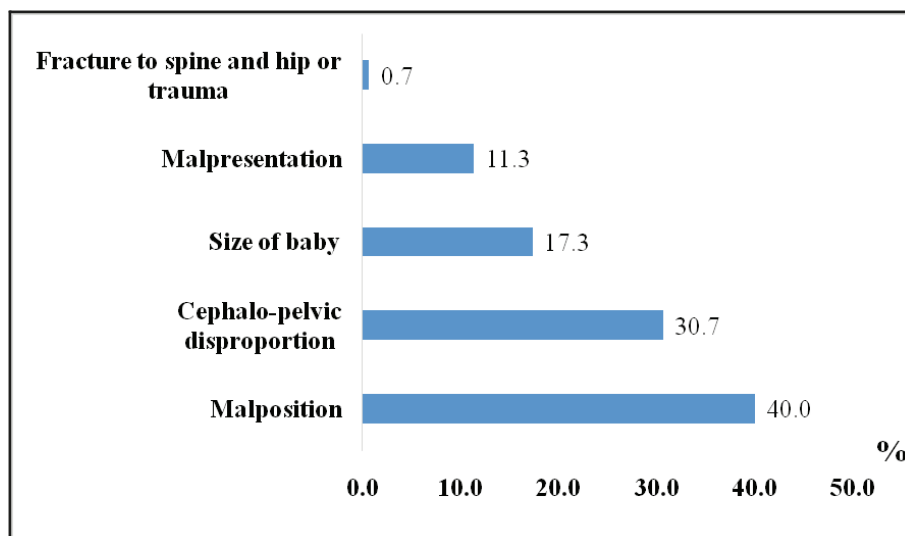
Regarding the antenatal care visits, around two thirds of the women (101), (67.3%) were attending the antenatal care clinics. At last, the table demonstrates that (68), (45.1%) of the women had attended the hospital by themselves (without referred),

and (59), (39.3%) were referred from a hospital (Table 1). The Percentage of causes of obstructed labor are shown in Figure 1.

It is evident in Table 2 that (10), (6.7%) of the fetuses had congenital malformation. Half of the anomalies were hydrocephalus. Regarding the Apgar score, (11), (7.3%) and (5), (3.3%) of the newborn babies had severely depressed score in the first and fifth minutes respectively. The table shows that (25), (16.7%) of the newborn babies were admitted to the NICU, and (5), (3.3%) of them had low birth weight of less than 2500 gms (Table 2).

**Table 1** Basic characteristics of the studied sample

	No.	%
<b>Age (years)</b>		
< 20	8	5.3
20-35	126	84.0
> 35	16	10.7
<b>Parity</b>		
Primiparous	67	44.7
Multiparous	75	50.0
Grand multiparous	8	5.3
<b>Educational level</b>		
Illiterate	12	8.0
Read and write	61	40.7
Primary school	57	38.0
Intermediate and secondary school	20	13.3
<b>Residency</b>		
Urban	92	61.3
Rural	58	38.7
<b>Smoking</b>		
Yes	8	5.3
No	142	94.7
<b>Antenatal care</b>		
Yes	101	67.3
No	49	32.7
<b>Source of referral</b>		
Traditional birth attendant	1	0.7
Hospital	59	39.3
Health center	22	14.7
<b>None (Attended by herself)</b>	68	45.3
<b>Total</b>	150	100



**Figure 1** Causes of obstructed labor

**Table 2** Fetal outcomes

	No.	(%)
<b>Congenital anomalies</b>		
Yes	10	(6.7)
No	140	(93.3)
<b>Types of congenital anomalies (n = 10)</b>		
Hydrocephalus	5	(50.0)
Microcephaly	1	(10.0)
Fetal tumor	1	(10.0)
Anencephaly	1	(10.0)
Others	2	(20.0)
<b>Sex of the baby</b>		
Male	78	(52.0)
Female	72	(48.0)
<b>Apgar score in 1<sup>st</sup> minute</b>		
Depressed severely 0-3	11	(7.3)
Depressed moderately 4-6	56	(37.3)
Excellent 7-10	83	(55.3)
<b>Apgar score in 5<sup>th</sup> minute</b>		
Depressed severely 0-3	5	(3.3)
Depressed moderately 4-6	20	(13.3)
Excellent 7-10	125	(83.3)
<b>Admission to NICU</b>		
Yes	25	(16.7)
No	125	(83.3)
<b>Weight of the baby</b>		
< 2500	5	(3.3)
2500-3999	111	(74.0)
≥ 4000	34	(22.7)
Total	150	(100.0)

There was no statistically significant association between the causes of obstructed labor with congenital anomalies, sex of the newborn, Apgar score in the first minute and five minutes, and admission to NICU. The majority of the women

with macrocosmic newborn as a cause of obstructed labor had babies weighing  $\geq$  4000 grams, compared with much lower percentages among the other causes (Table 3).

**Table 3** Fetal outcomes by causes of obstructed labor

	Mal-position No. (%)	Cephalo-pelvic disproportion No. (%)	Size of the baby No. (%)	Others** No. (%)	<i>P</i> value
<b>Congenital anomalies</b>					
Yes	3 (5.0)	4 (8.7)	2 (7.7)	1 (6.7)	
No	57 (95.0)	42 (91.3)	24 (92.3)	17 (94.4)	0.870*
<b>Sex of baby</b>					
Male	33 (55.0)	20 (43.5)	17 (65.4)	8 (44.4)	
Female	27 (45.0)	26 (56.5)	9 (34.6)	10 (55.6)	0.280†
<b>APGAR score in 1<sup>st</sup> minute</b>					
Depressed severely	2 (3.3)	4 (8.7)	2 (7.7)	3 (16.7)	
Depressed moderately	21 (35.0)	14 (30.4)	11 (42.3)	10 (55.6)	
Excellent	37 (61.7)	28 (60.9)	13 (50.0)	5 (27.8)	0.115*
<b>APGAR score in 5<sup>th</sup> minute</b>					
Depressed severely	2 (3.3)	2 (4.3)	0 (0.0)	1 (5.6)	
Depressed moderately	8 (13.3)	3 (6.5)	4 (15.4)	5 (27.8)	
Excellent	50 (83.3)	41 (89.1)	22 (84.6)	12 (66.7)	0.291*
<b>Admission to NICU</b>					
Yes	8 (13.3)	6 (13.0)	5 (19.2)	6 (33.3)	
No	52 (86.7)	40 (87.0)	21 (80.8)	12 (66.7)	0.226--*
<b>Weight of the baby (grams)</b>					
< 2500	3 (5.0)	0 (0.0)	1 (3.8)	1 (5.6)	
2500-3999	50 (83.3)	42 (91.3)	3 (11.5)	16 (88.9)	
$\geq$ 4000	7 (11.7)	4 (8.7)	22 (84.6)	1 (5.6)	< 0.001*
<b>Total</b>	60 (100.0)	46 (100.0)	26 (100.0)	18 (100.0)	

\*By Fisher's exact test. †by Chi square test. \*\*Malpresentation and fracture of spine or hip.

A significant association was detected between parity and the causes of obstructed labor, where it is obvious in Table 4 that the major causes among the grand multiparous women were big

newborn and malpresentation while the main causes of the primiparous women were malposition and cephalo-pelvic disproportion.

**Table 4** Causes of obstructed labor by maternal characteristics

	Malposition	Cephalo-pelvic disproportion	Size of the baby	Others**	P value
	No. (%)	No. (%)	No. (%)	No. (%)	
<b>Age</b>					
< 20	3 (37.5)	5 (62.5)	0 (0.0)	0 (0.0)	
20-35	53 (42.1)	37 (29.4)	22 (17.5)	14 (11.1)	
> 35	4 (25.0)	4 (25.0)	4 (25.0)	4 (25.0)	0.208*
<b>Parity</b>					
Primiparous	32 (47.8)	26 (38.8)	6 (9.0)	3 (4.5)	
Multiparous	26 (34.7)	20 (26.7)	17 (22.7)	12 (16.0)	
Grand multiparous	2 (25.0)	0 (0.0)	3 (37.5)	3 (37.5)	0.001*
<b>Smoking</b>					
Yes	5 (62.5)	2 (25.0)	1 (12.5)	0 (0.0)	
No	55 (38.7)	44 (31.0)	25 (17.6)	18 (12.7)	0.740*
<b>Antenatal care</b>					
Yes	38 (37.6)	33 (32.7)	19 (18.8)	11 (10.9)	
No	22 (44.9)	13 (26.5)	7 (14.3)	7 (14.3)	0.671†
Total	60 (40.0)	46 (30.7)	26 (17.3)	18 (12.0)	

\*By Fisher's exact test. †by Chi square test. \*\*Malpresentation and fracture of spine or hip.

## Discussion

Obstructed labor is one of the dangerous complications of pregnancy. In the western world, it is almost vanished, but in the developing societies, it is still one of the major reasons for maternal and perinatal death.<sup>12</sup>

Current study revealed the rate of obstructed labor being 1.6% over 1 year study period. This rate is regarded to be lower than India 2.5% and Eastern Nigeria 4.7%.<sup>13</sup> The lower rate of obstructed labor in our locality may be due to having good protocol for management of labor, good nursing training, good rotator that do follow up women at labor room by partogram, fetal heart monitoring, better obstetric care, early referral women to the hospital, and good facilities for transport of patients.

The higher incidence in other countries is explained by delayed recognition of disproportion, and shows the general quality of the health system, poverty, educational status, high prevalence of home-birth, lack of attentive obstetric care, pregnancy in teenagers, socioeconomic status being low, delayed referral, infrastructure being poor, and facilities not being adequate for transporting patients from remote areas.<sup>14</sup> There was no statically significance associated between sociodemographic characterization of age, smoking, gestational age, residency and obstructive labor in current study while in Pakistan they did a study there was significant associated mostly illiterate and from rural area. This is may be most rural mothers are had low health seeking behavior and low resource for health service cost which delay decision. On the other hand, these mothers may have increased obstructive labor risk in relation to educational status, distance, nutritional habit and knowledge, and other factors.<sup>15</sup>

About parity in this study there was statically significant associated between parity and obstructed labor that was majority multiparous, while in Pakistan there was statically association between parity and obstructive labor being mostly

nulliparous this is do to sociodemographic differences.<sup>16</sup>

About attending labor room the only 45.5% of women that attended labor room by themselves without a referral, 39.3% were referred from other hospitals which were mostly far away from our hospital. Controversy to that there was the study also indicated that the higher odds of obstructed labour among women who reside within 10–50 kilometers compared to those who reside below 10 kilometers. This finding is in line with studies done in Ethiopia .The reason might be the lack of health seeking behavior; they had no ANC follow up, and a bad attitude towards health professionals and center. Health professionals who work on delivery cases' teams at health centers should attend a training course about timing and cases for referring women in labor to the higher level health centers. This could be explained as women might be referred after a long time stay at the lower level facilities either due to lack infrastructure and transportation. This may improve diagnosis and treatment of obstructed labor that decrease the rate of obstructed labor.

Regarding the antenatal care visits, this study around two thirds of the women were attending the antenatal care clinics. Controversy to this study ,the study done in Nigeria that Sixty-two percent of the obstructed labor cases did not have any ANC follow-up.<sup>17</sup>

The knowledge of pregnant women who do not have prenatal care is less when it comes to conditions of pregnancy like fetal macrosomia and anomalies, multiple pregnancies, and other factors which increase the risk of obstructed labor. These women are also more liable to deliver at home, have poor awareness or be unaware about preparations for birth and its complications, as well as reading plan and pregnancy signs which are dangerous and elevate the risk of obstructed labor.

Malposition 40.0% and cephalo-pelvic disproportion 30.7% are considered to be



the main causes of obstructed labor. Contrast to our study the main cause of obstructive labor in Pakistan are cephalo-pelvic disproportion which are 64.65% of all causes.<sup>17</sup> Based on these it could be said that in Ethiopia, the prevalence of cephalo-pelvic disproportion is relatively high, where girls are short, have a malnourished growth, get married at a young age, and go through pregnancy while their pelvis is not fully grown; malpresentation and malposition are two other sources of obstructed labor with a rate of 27.4 per a hundred of all cases this is why in Pakistan main cause of obstructed labor was cephalo-pelvic disproportion. A research which was performed at Pakistan Public Sector University was consistent with these results.<sup>17</sup>

Furthermore, the findings of this study showed that low birth weight was the commonest adverse perinatal outcome we found that 16.7% of neonates were admitted to NICU, a proportion exceeding one third stayed in the NICU for 4-5 days due to low birth weights. Jaundice developed in the neonates because of prematurity or ABO incompatibility. Birth asphyxia caused by fetal malposition due to difficult labor was the main reason for the neonates to be admitted to the NICU. After several hours of laboring, the women who were diagnosed with obstructive labor gave birth to a living infant having a congenital malformation; who died after being admitted to the NICU. Two neonates (4.3%) died after an emergency cesarean section child delivery.

The reason for the death of one of the infants was a fetal tumor with multiple congenital malformations, and the cause for the other infant's death was hydrocephalus and spine bifida. Both died after staying for 24 to 48 hours in the NICU. In contrast to our study there was high perinatal loss among obstructive case in Pakistan 50-62% which could be caused by variation in sample size in our study is small, variations in equipment availability to deal with neonates that are

asphyxiated, or the fetuses' status while being admitted to the hospitals or variations in the skill of neonatal resuscitation.<sup>18</sup> Pakistan and Jimma Specialized Hospital have conducted studies proving that 88 to 98% of babies' birth cases which are born alive through obstructive labor are diagnosed with birth asphyxia.<sup>19</sup>

However, the birth asphyxia rate in this study is higher in comparison to studies conducted in India and Nigeria where the birth asphyxia rates were 35.7% and 37.3, respectively.<sup>17-19</sup> The reason for this can be considered as variation in skills of neonate's Apgar score assessment or the fetuses' status when admitted or the intervention type done to soothe the problem.<sup>19</sup>

The prevention of obstructed labor can be done by supporting the mother with optimal obstetric care, providing good nutrition as it is a major element for a normal pelvis, although it takes a long time to obtain the intended goal, providing enough resources to improve the referral system, and attaining a high infrastructure level to reach a health faculty that has the ability to manage obstructed labor is recommended. Advancing institutional service utilization for managing and preventing obstructed labor and complication of obstructed labor is better as soon as possible.

The main limitation of this study is duration of 1 year. The major strength of the study is that it is first published report on women who delivered with obstructed labor to determine the rate of these conditions and perinatal outcomes.

## Conclusion

Obstructed labour remains an important cause of maternal and fetal mortality and morbidity in many parts of the world. Obstructive labor is common during labor. Early recognition of obstructed labor cases and immediate safe abdominal or vaginal delivery can decrease the incidences of maternal and perinatal morbidity and mortality. this study reveled that there was

low prevalence rate of obstructed labor in our hospital. Majority of the women were have regular ANC follow up. Malposition was mostly cause of obstructive labor and parity also has relation with it. Neonatal morbidity and mortality are dependent on the type of presentation and cause of obstructed labours.

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Not applicable.

### Competing interests

The authors declare that they have no competing interests.

### References

1. Shaikh S, Shaikh AH, Shaikh SAH, Isran B. Frequency of obstructed labor in teenage pregnancy. *NJOG* 2012; 7(1):37–40. <https://www.nepjol.info/index.php/NJOG/article/view/8834>
2. Gabbe SG, Niebyl JR, Simpson JL, Landon MB, Galan HL, Jauniaux ERM, et al. *Obstetrics: Normal and Problem Pregnancies E-Book*. Elsevier Health Sciences 2016. P. 1426.
3. Tolentino L, Yigeremu M, Teklu S, Attia S, Weiler M, Frank N, et al. Three-dimensional camera anthropometry to assess risk of cephalopelvic disproportion-related obstructed labour in Ethiopia. *J R Soc Interface* 2019; 9(5):20190036. <https://doi.org/10.1098/rsfs.2019.0036>
4. Motomura K, Ganchimeg T, Nagata C, Ota E, Vogel JP, Betran AP, et al. Incidence and outcomes of uterine rupture among women with prior caesarean section: WHO multicountry survey on maternal and newborn health. *Sci Rep* 2017; 7(1):44093. <https://doi.org/10.1038/srep44093> (2017).
5. Kabakyenga JK, Östergren PO, Turyakira E, Mukasa PK, Pettersson KO. Individual and health facility factors and the risk for obstructed labour and its adverse outcomes in south-western Uganda. *BMC pregnancy and childbirth* 2011; 11(1):1–10. <https://doi.org/10.1186/1471-2393-11-73>
6. Abraham W, Berhan Y. Predictors of labor abnormalities in university hospital: unmatched case control study. *BMC pregnancy and childbirth* 2014; 14(1):1–11. <https://doi.org/10.1186/1471-2393-14-256>
7. Ali AA, Adam I. Maternal and perinatal outcomes of obstructed labour in Kassala hospital, Sudan *J Obstet Gynaecol* 2010; 30(4):376–7. <https://doi.org/10.3109/01443611003672096>
8. Pilliod RA, Caughey AB. Fetal malpresentation and malposition: diagnosis and management. *Obstet Gynecol Clin* 2017; 44(4):631–43. <https://doi.org/10.1016/j.ogc.2017.08.003>
9. New birth weight curves tailored to baby's ethnicity. Toronto Star Accessed 22 September, 2016. thestar.com. [https://www.cbc.ca/news/canada/toronto.18\\_keyl.events.in.the.case.1.715266](https://www.cbc.ca/news/canada/toronto.18_keyl.events.in.the.case.1.715266)
10. Stillbirths. World Health Organization Accessed 29 September, 2016 <https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/maternal-health/stillbirth-prevention>
11. Obstetricians AC of, Gynecologists, Pediatrics AA of. Committee Opinion No. 644: ASOG 2015; 126(4):e52–5. <https://doi.org/10.1097/AOG.0000000000001108>
12. Wube TT, Demissie BW, Assen ZM, Gelaw KA, Fite RO. Magnitude of Obstructed Labor and Associated Factors Among Women Who Delivered at Public Hospitals of Western Harerge Zone, Oromia, Ethiopia. *Clin Med Res* 2018; 7(6):135. <https://doi.org/10.11648/j.cmr.20180706.11>
13. Bako B, Barka E, Kullima AA. Prevalence, risk factors, and outcomes of obstructed labor at the University of Maiduguri Teaching Hospital, Maiduguri, Sahel. *Med J* 2018; 21(3):117. <https://www.smjonline.org/text.asp?2018/21/3/117/242748>
14. Revicky V, Muralidhar A, Mukhopadhyay S, Mahmood T. A case series of uterine rupture: lessons to be learned for future clinical practice. *JOGI* 2012; 62(6):665–73. <https://doi.org/10.1007/s13224-012-0328-4>
15. Mondal S, Chaudhuri A, Kamilya G, Santra D. Fetomaternal outcome in obstructed labor in a peripheral tertiary care hospital. *Med J DY Patil Univ* 2013; 6(2):146. <https://www.mjdrdyu.org/text.asp?2013/6/2/146/110301>
16. Khooharo Y, Majeed T, Khawaja MA, Majeed N, Majeed N, Malik MN, et al. Even in 21st century still obstructed labor remains life threatening condition. *Ann King Edw Med Univ* 2012; 18(3):279–9. <https://doi.org/10.21649/akemu.v18i3.416>
17. Addisu D, Mekie M, Melkie A, Yeshambel A. Burden of obstructed labor in ethiopia: A systematic review and meta-analysis. *Midwifery* 2021; 95:102930. <https://doi.org/10.1016/j.midw.2021.102930>
18. Gupta R, Porwal SK. Obstructed Labour: Incidence, causes and outcome. *Int J Biol Med Res* 2012; 3(3):2185–8.
19. Ahmed S, Naz I, Khokhar S, Baloch R. Incidence causes and outcome of obstructed labor in Sheikh Zaid Women Hospital Larkana - A tertiary care hospital. *MC* 2013; 19(2):40–3.