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Preventing Adverse Maternal and Perinatal Events from Obstetric Interventions Given Women at Childbirth in Al-Sadaka Teaching Hospital, Aden, Yemen

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Authors' contributions

This work was carried out in collaboration among all authors. Author IAN developed the study idea, data collection, and writings. Author AB supervised the analysis of the database and contribute in drafted the manuscript, writing and editing. Author AH initiate the work and edited the manuscript and supervised the bulk of the work. All authors were involved in the interpretation of the data and writing the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Any perinatal intervention during the childbirth may have significant impact on the outcome of the mother and her newborn. The aim of this study was to correlate the association between the occurrence of adverse events and appropriate intervention, health care providers' commitment to standards of services during labor and working time.
Study Design: This cross-sectional study.
Place and Duration of Study: Tertiary referral hospital-based in Aden city, Yemen.
Methodology: A validated questionnaire and observational check list were used to collect the data along the six months study period. Women were included in the study according to criteria: vertex presentation, singleton fetus, and in an active labor. Data were analyzed using SPSS program and p value of <0.05 was considered as significant. Adjusted and unadjusted values were used to examine the association between different types of adverse events and related variables.

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Results: A total of 342 adverse event episodes were identified among both mother and newborn with overall prevalence of adverse events was12.7%. Prolonged (labor) second stage was found strongly associated as risk factor during childbirth with multiparousm others (p=001) as well as the use of uterine fundus pressure was detected as one of the intervention method during labor was associated with AEs among mothers (AOR:2.715; 95% CI: 1.223-6.029; P value: 0.014).
Conclusion: Adverse events among mothers constituted the highest percentage in comparison to their occurrence among newborns or among both newborns and their mothers. Interventions such as uterine funds pressure and episiotomy were reported as having considerable adverse events mainly among newborns.

Keywords: Adverse events; childbirth; labor; women; newborn.

ABBREVIATIONS

AEs : Adverse events
WHO : World Health Organization

1. INTRODUCTION

The World Health Organization (WHO) estimates that tens of millions of patients worldwide suffer disabling injuries or death every year due to unsafe medical practices and care [1]. The effect of medical errors and unsafe systems of care has had a profound effect on the practice of obstetrics and gynecology [2].

Patient harm can occur as a result of a complex of factors and circumstances and the understanding of these contributing factors is essential to develop an effective and efficient solutions for different contexts and environments and to build safer health systems [3]. Moreover, around 88-98% of maternal deaths can be prevented if good quality emergency obstetric care is available [4]. Recent studies illustrated that unintentional failures in obstetrics and gynecology usually are the result of a chain of events and a complex interaction between a varied set of systems, including: human behavior, performance and interdependency, technological aspects, a range of organizational and procedural weaknesses, and socio-cultural factors [5].

High maternal mortality rate is primarily due to a lack of skilled health care personnel for antenatal, delivery and postnatal care. In Yemen, pregnancy and childbirth are “life-threatening events”. Maternal deaths account for 42% of all female deaths among women of reproductive age (15-49 years) [6]. Nearly one in ten patients is harmed while receiving health care in well-funded and technologically advanced hospital settings. However, much less is known about the burden of unsafe care in non-hospital settings, which provide the majority of health-care services globally. Even more importantly, there is very little evidence about the burden of unsafe care in developing countries, like Yemen, where there is likely to be an even greater risk of harm to patients due to limitations in infrastructure, technologies and human resources [7]. Many authors described the human factors influencing the occurrences of adverse effect. These includes, variations in healthcare provider training & experience [8,9] diverse patients, unfamiliar settings, time pressures, as well as the failure to acknowledge the prevalence and seriousness of medical errors [10,11]. It is also likely to consider the system failure and it is elements could be considered among the adverse events. This failure of the health system includes poor communication, unclear lines of authority of physicians, nurses, and other care providers [9].

Although Al-Sadaka Teaching hospital is considered as one of the referral hospitals for patients coming from the neighbor provinces, no data showed the occurrence of adverse events committed by the health care providers during childbirth among pregnant women and their newborns during childbirth. Therefore the main aim of this study was to determine the association between the quality of obstetric care and adverse events among pregnant women in labor during the childbirth in Al Sadaka Teaching hospital in Aden governorate, and particularly to correlate the standards of services during labor, working time and health professionals'' performance to the occurrence of adverse events.

2. METHODS

2.1 Study Design and Setting

A hospital-based cross-sectional study was conducted in Al Sadaka Teaching Hospital, Aden

governorate with a total population of 589,419 people. This hospital is the largest specialized obstetric facility in the southern governorates of Yemen, with a total of 708 beds and an average of a caseload of 6000 annual admission [12]. Moreover, the hospital is located in a highly populated area and closer to other adjacent governorates where the people get access easily to reach to the hospital. A comprehensive range of services including primary, secondary as well as tertiary obstetrics, gynecology and pediatrics care are provided in the hospital. This study was conducted in the year 2013-2014 along 6 months.

2.2 Study Participants

All pregnant women at full term in labor attending Al-Sadaka teaching hospital with vertex presentation, singleton fetus, and in active labor were included in this study after consented. Any woman with abnormalities of labor such as none vertex presentation, multiple pregnancy, preterm or post term pregnancy, intrauterine death before starting labor, previous lower segment cesarean section, premature rupture of membrane, and those with pregnancy complication or disease during pregnancy were excluded.

Enrollment of mothers in the study was underwent after a clear description of the aim of the study, its importance and that all the information of the patient will be dealt with confidence and privacy. A verbal consent was obtained from participated mother as an inclusion agreement. Sometimes for severely condition mothers, a help was asked from her close relative such as mother or sister who can cooperate and provide the available information.

2.3 Sampling and Data Collection Tool

It was reported elsewhere that 8.4% of the total women using a health-care institutions would be under the risk of having adverse effect during the childbirth [13]. According to the assumption from annual report of the hospital, 6000 women were annually admitted to Al-Sadaka hospital for delivery, and thus, it was expected to meet a sample size of 312 childbirth with adverse events, using the power of 80%, 95% confidence interval, and a margin of error of 3.4%.

Different sources of data collection were used and assessed: Patient's file, registration books, observation of the staff performance especially in delivery and post- delivery rooms, in addition to a face to face interview with pregnant women. Moreover, an observational checklist was used as a tool for data collection in this study with a focus on assessing the quality of health care provided during labor in emergency, pre-labor, delivery and post-delivery rooms and explore the level of maternal outcome required. This checklist was adopted from a study conducted elsewhere; it was translated from English to Arabic language and then backward to English [14].

Data collection was restricted for 180 days to adopt the offered available logistics. Part of the collected data was based on the reported information and outcomes for both mothers and newborns in the labor room and face to face interview with pregnant women, over the three working shifts (morning, afternoon, and evening). An observational English version checklist was used as a tool for data collection in this study and adopted from a study conducted elsewhere [14]. The main aim of the checklist is to assess the maternal outcome, health care providers' performance during labor, and any intervention procedures made during delivery and post-delivery.

The content of the questionnaire was divided into four parts: 1) Assessing the admission in emergency room included the women condition at the time of admission, socio-demographic background such as age, address, level of education and family income. 2) Assessment during the pre-labor stage such as monitoring the general condition of the women in labor and her fetus in addition to the assessment of the progress of labor, and whether the intervention was done. 3) Assessment during the delivery room which is related to the second stage of labor with focus on the conditions leading to the occurrence of adverse events, the assessment for the fetal monitoring during the second stage whether it is appropriate or not, whether intervention was done for her, and finally, 4) The assessment of the post- delivery condition which includes the conditions during the postpartum period.

2.4 Data Collection Methods

All the 2528 patients were received, and the basic data were collected for all as part of the hospital record. Then after, each patient was followed during the childbirth time, with reporting all the interventions done for her or for her baby. If any manifestation of adverse events reported, then the patient was considered as included

among the study group just to analyse the associated factor during the childbirth. All patients were interviewed at the beginning by a trained female nurse and with a supervision of the investigator for any clue. Training was conducted for 12 qualified health care providers who contributed in the collection of data. The training included sessions for how to use the observation as a method and the use of the checklist as well as to be familiar with the hospital setting and other medical logistical process of the data collection. The team was divided into four groups of three members to work in three day and night shifts on 24 hours. The assessment starts from the time women's admission. One observer starts following up staff's performance of care for woman in labor from the time of admission throughout labor and delivery, when an observer's shift ended, the next observer carries on from the point where the previous observer had stopped and continued observing the staff performance for the next shift, and so on till the delivered woman was discharged from the hospital. The completed checklists were collected daily and checked by the researcher, so that any misunderstanding or mistakes could be checked and resolved immediately with the observer; by this way the researcher could make sure about the inter-observer reliability.

Antenatal care score was constituted according to WHO guideline as: accepted for those who have more than 3 antenatal visits during pregnancy, bad for those with 1-3 antenatal visits during pregnancy, no antenatal care for those who did not had any visit during pregnancy [15].

The questionnaire was assessed by experts in public health, gynecologists and obstetricians in relation to the objectives of the study. Some modification was conducted accordingly.

A pilot study was carried out on a group of 20 women in labor one week before the beginning of the study and were not included in the main study. Analysis of the questions was undertaken to assess the reliability, consistency, and understanding of the questionnaire resulting in Cronbach's α of 0.74.

For assessing the findings and the outcome of the study, an operational definition for the adverse event was considered as that event associated with'unintended harm to the patient by an act of commissionor omission rather than by the underlying disease or condition of the patient" [16].

2.5 Data Analysis

Data cleaned and then entered the statistical package for social sciences (SPSS version 17). Descriptive analysis was used to illustrate the sociodemographic variables of the participants, association was calculated between outcome and the different related variables, and the p–values ≤ 0.05 was considered as statistically significant.

The occurrence of adverse events was calculated by recording the responses into dichotomous categories, with 0 = no and 1= yes, where then after a logistic regression model was implemented to examine the association between different types of adverse events and women in labor variables.

2.6 Ethical Considerations

Prior to carry out the study several levels of permission were obtained, including official approval from the authority of Aden health office, then followed by permission from the authority in the Al Sadaka teaching hospital**.** A verbal consent was obtained from all potential participants (women in labor and health care providers) after explaining the study objectives and that participation is voluntary. Also, they were informed that all information collected will be handled confidentially, and any participant has the right to withdraw from the study at any time.

3. RESULTS AND DISCUSSION

In this study, a total number of women admitted to the emergency department during the study period (180 days) was 4281, however, those attended for labor was 3793. Among those admitted for childbirth, only 2528 (66.7%) were enrolled and consented as they met the inclusion criteria.

Table 1 shows the sociodemographic characteristics of the participants with adverse events. Most of the participants were from different areas of Aden city (85.4%), at age group 20-30 years old (73.3%), holding primary school degree or illiterate (69.0%), and with family income ranged from low to intermediate (79.6%).

3.1 Overall Prevalence of Adverse Events

Among the 322-childbirth reported with AEs out of 2526 childbirths in Al-Sadaka Hospital, Aden City,a prevalence of 12.7% was reported. However, the total reported adverse events were

342 episodes among the study cohort: 268 (78.4%), 34 (10.6%), and 20 (6.2%) were reported for Mothers, Newborn, and Mother Newborn pairs, respectively. In regard to the parity, the majority of mothers were under the category of multiparous (72.0%) and the rest were first time has experienced the childbirth (nulliparous 28.0%).

3.2 Association between the Adverse Events among New Borns and Factors Related to Mother

Table 2. showed the association between adverse events reported among newborn and some factors related to mother either before labor like the adequate level of antenatal visits or during the labor with use of some interventions such as prolonged labor, adverse events in mother, mother parity, uterus fundus pressure, perform episiotomy, and application of oxytocin. Of the above-mentioned factors, three were found statistically associated with adverse events occurred among newborns such as early death, stillbirth, or exposed to neonatal intensive care unit with p value < 0.01.

3.3 Quality of Infection Control during the Childbirth by Health Care Workers

The overall quality of infection control was calculated as a sum of the four main infection control procedures that should be of adequate adherence of medical performance during childbirth. These procedures includes hand washing by the health care worker who conduct the delivery, use of sterile gloves, use of antiseptic solution for perineal cleaning, and the appropriate disposal of the gloves. The answers for these questions limited to “Yes=1” and “No=0”.Accordingly, the average mean value of 53.4 was chosen as cut-off point for the overall quality of the infection control implemented during childbirth in this hospital. Thus, the findings showed that only 23% of the healthcare workers were adherent to the infection control instructions. However, the majority of the health care workers (HCW) used disposable gloves and antiseptic solution for perineum cleaning (79.2%, 88.2%, respectively), but no statistically significant association was found between those factors and the adverse events among newborns or his mother (P>0.05), as seen in Table 3.

Table 4 illustrated the performance of the health care providers experience either doctors or nurses in the process of childbirth within the relation to mothers’ characteristics before and during childbirth and the type of intervention performed. No statistically significant differences between the contribution of doctors or nurses in the occurrence of AEs in the newborn, except in relation to multipara mother or when performing the uterine fundus pressure to facilitate the childbirth (p< 0.05, and 0.01, respectively).

Model of regression analysis was applied to show the association of the staff assisted in delivery and the implication of the intervention performed. Four intervention factors (uterine fundus pressure, perform episiotomy, application of oxytocin, and blood transfusion) were used to test the adjusted regression and non-adjusted

Table 1. Socio-demographic characteristics of the study population

Characteristics		Cases N=(322) no	%
Residency	Aden	275	85.4
	Outside Aden	47	14.6
Age group (years)	< 20	33	10.2
	20 – 30	236	73.3
	>30	53	16.5
Educational level	Illiterate	100	31.1
	Primary	122	37.9
	Secondary	69	21.4
	University	31	9.6
Family income\capita	Low	147	45.7
	Intermediate	109	33.9
	High	66	20.5

Table 2. Association between the adverse events among newborns and factors related to mother

Factors related to mother		Adverse events				P value
		Newborns		Mothers		
		No.	%	No.	%	
Antenatal care	no	6	21.4	54	18.4	0.691
	yes	22	78.6	240	81.6	
Prolonged labor	no	25	89.3	239	81.3	0.293
	yes	3	10.7	55	18.7	
Adverse events in mother	no	19	67.9	15	5.1	0.001
	yes	9	32.1	279	94.9	
Mother parity	nulliparous	1	3.6	88	29.9	0.003
	multiparous	27	96.4	206	70.1	
Uterine fundus pressure	no	28	100.0	186	63.3	0.001
	yes	0	0.0	108	36.7	
Perform episiotomy	no	21	75.0	207	70.4	0.610
	yes	7	25.0	87	29.6	
Application of oxytocin	no	24	85.7	253	86.1	0.960
	yes	4	14.3	41	13.9	

Table 3. Association between the adverse events among newborns and factors related to health professionals' performance

Factors related to performance		Adverse events						
		Total		Mothers		Newborns		P
		No.	%	No.	%	No.	%	value
Doctor who conduct delivery wash hands	no	236	73.3	216	73.5	20	71.4	0.816
	yes	86	26.7	78	26.5	8	28.6	
Doctor use sterile gloves	no	259	80.4	238	81.0	21	75.0	0.448
	yes	63	19.6	56	19.0	7	25.0	
Doctor use disposable gloves	no	67	20.8	59	20.1	8	28.6	0.290
	yes	255	79.2	235	79.9	20	71.4	
Use antiseptic solution for perineal cleaning	no	38	11.8	36	12.2	2	7.1	0.424
	yes	284	88.2	258	87.8	26	92.9	
Overall quality of infection control	no	248	77.0					
	yes	74	23.0					

modality with the type of staff assisted the childbirth. Uterine fundus intervention was found two-times more likely performed by the nurses than the doctors on assisting the delivery (OR:3.215; 95% CI: 1.308-7.904; P value: 0.011, and AOR:2.715; 95% CI: 1.223-6.029; P value: 0.014, respectively), as seen in Table 5.

Five factors were analyzed as associated to AEs among newborns such as the category of the staff assisted the delivery (doctor or nurse), the time of working duty the delivery occurred (morning, afternoon, evening), the day of delivery as in a working day or a holiday, the availability of pediatrician during delivery, and the appropriateness of the follow-up during the first hour post-delivery. No statistical significance difference was found in the analyses of all these factors (p value >0.05), as seen in Table 6.

3.4 Out of Standard Health Professionals' Performance during Childbirth and its Impact on Adverse Events Occurrence

Based on the check list on the performance of the clinical staff during childbirth in the labor room, three main elements were assessed by the investigator and the assistant team as according to the standard or not if taken regularly or not. These elements include, maternal condition (pulse, blood pressure, temperature), fetal condition (fetal heart sound stage 1, and fetal heart sound stage 2), and progress of labor

(uterine contractions, vaginal examination). In general, low rate was reported on the lack of adherence to the standard of care, however, the only statistically significant findings was observed when associate the occurrence of adverse events with vaginal examination (p=0.023), as seen in Table 7.

The findings of the present study show that AEs occurrence among mothers and newborns is linked to uterine fundus pressure by the staff, multiparous mother, and frequent vaginal examination particularly among those with prolonged labor.

The main goal of the present study is to answer the research question "why do adverse events occur during labour and affect the health of mothers and their newborns, during the normal physiological function of childbirth? Do the actual obstetric practices, the performance of the health care workers and the hospital environment increase the risk of the occurrence of adverse events among mother/newborn during the childbirth in the current study setting?

The findings of this study showed that the overall prevalence of AEs among mothers and their newborns was 12.7%. This finding was higher than what has been found in studies from Canada and the USA (7.5% and 9%, respectively), [17,18], and much higher than what has been reported in studies conducted in Jordan, Sudan, and Egypt (2.5%, 5.5%, and 6%, respectively), [4,19]. However, prevalence of AEs in a delivery centres is affected by so many factors, patients risk characteristics, infrastructure and equipment availability and quality of labour attendance [9]. Our hospital is a teaching hospital and a referral

Table 4. Association between the adverse events, mothers' characteristics and health professionals involved in childbirth process

Factor related to mother		All		Staff assisted in delivery				P value
				Doctors		Nurses		
				No.	%	No.	%	
Antenatal care	no	60	18.6	6	22.2	54	18.3	0.617
	yes	262	81.4	21	77.8	241	81.7	
Prolonged labor	no	264	82.0	21	77.8	243	82.4	0.552
	yes	58	18.0	6	22.2	52	17.6	
Adverse events among mothers	no	288	89.4	22	81.5	266	90.2	0.160
	yes	34	10.6	5	18.5	29	9.8	
Mother parity	nulliparous	89	27.6	12	44.4	77	26.1	0.041
	multiparous	233	72.4	15	55.6	218	73.9	
Uterine fundus pressure	no	214	66.5	12	44.4	202	68.5	0.011
	yes	112	33.5	15	55.6	93	31.5	
Perform episiotomy	no	228	70.8	17	63.0	211	71.5	0.349
	yes	94	29.2	10	37.0	84	28.5	
Application of oxytocin	no	277	86.0	24	88.9	253	85.8	0.654
	yes	45	14.0	3	11.1	42	14.2	
Total		322	100.0	27	8.4	295	91.6	

Table 5. Regression analysis of role of the staff assisted in delivery with the type of intervention

Intervention related Factor		OR	95% CI	P value	AOR	95% CI	P value
Uterine fundus pressure	no	R	-	-	R	-	-
	yes	3.215	1.308 -7.904	0.011	2.715	1.223 - 6.029	0.014
Perform episiotomy	no	R	-	-	-	-	-
	yes	0.942	0.372 - 2.385	0.900	-	-	-
Application of oxytocin	no	R	-	-	-	-	-
	yes	0.600	0.167 -2.159	0.434	-	-	-
Blood transfusion	no	R	-	-	-	-	-
	yes	2.063	0.835 -5.093	0.116	-	-	-

R=Reference

Table 6. Association between adverse events and factors related to mother (staff category, time of delivery, pediatrician available, appropriate postpartum follow up)

Factor related to mother		Adverse events				
		Newborn		Mothers		P value
		No.	%	No.	%	
Type of staff assisted the delivery	doctor	25	8.5	2	7.1	0.804
	midwife	269	91.5	26	92.9	
Delivery at duty	morning	66	22.4	8	28.6	0.658
	afternoon	77	26.2	8	28.6	
	night	151	51.4	12	42.9	
Delivery at a day of	holiday	64	21.8	9	32.1	0.210
	non holiday	230	78.2	19	67.9	
Pediatrician available during delivery	no	226	76.9	25	89.3	0.130
	yes	68	23.1	3	10.7	
Appropriate 1st hour postpartum follow up	no	281	95.6	25	89.3	0.143
	yes	13	4.4	3	10.7	

Table 7. Task performance out of the standard care during childbirth and its impact on AEs

Variables		Adverse events				
Factor related to mother		Newborn		Mothers		P value
		No.	%	No.	%	
Maternal condition	Pulse	23	7.8	5	17.9	0.072
	Blood pressure	16	5.4	2	7.1	0.708
	Temperature	5	1.7	2	7.1	0.059
Fetal condition	Fetal heart sound stage 1	34	11.6	1	3.6	0.194
	Fetal heart sound stage 2	7	2.4	1	3.6	0.150
Progress of labor	Uterine contractions	58	19.7	9	32.1	0.122
	Vaginal examination	31	10.5	7	25.0	0.023

centre, so it is expected to have a higher rate. However, the prevalence of AEs in our study was lower than that reported in studies form Palestine, Morocco, and in a previous study conducted in Yemen (14.2%, 15%, and 18.4%, respectively) [4,20].

There is no significant statistical association between the time of childbirth and the occurrence of AEs, however the rate was higher in the night shift (51.4%) than morning or afternoon particularly for the early neonatal death which was higher among those who born at night duty; this findings was higher than what has been reported in a study conducted in Sweden (12.0%) [21]. No clear explanation can be given for such findings, it could be related to the shortage of the staff and the burnout to which staff are subjected particularly in the night shift. This issue needs further investigation.

Newborn early death and stillbirth are an important outcome to be avoided as adverse events during the childbirth practice. It also reflects the quality of obstetric and pediatric care available [22,23]. Therefore, a good practice by both doctors and nurses should be harmonic in favor of the mothers childbirth and the live of the newborn. The role of each one is dependent on the different factors including gender characteristics, cultural values, health system constitution and many others. For example, midwives in many healthcare facilities are responsible to provide care for women throughout the course of their pregnancy and provide assistance during labor and delivery [24,25]. However, it is interesting that it is more likely nurses in our study have used two times the uterine fundus pressure as type of intervention during labor more than the doctors (AOR:2.715; 95% CI: 1.223-6.029; P value: 0.014). It was documented that the use of this maneuver during painful delivery can be traumatic and results in uterine rupture. A study from Japan, showed that laceration of the birth canal was the most frequently occurring maternal AE, followed by cervical laceration [26]. It is probably that the nurses in our hospital were not much aware of the AEs that can be developed as a result of such intervention during labor, as well

as inadequate supervision and guidance by senior experienced health professionals.

Other study illustrate that mothers cared for at centers where midwives and physicians work together received fewer interventions during labor (such as the use of induction, oxytocin, or cesarean) than mothers who received care at centers where obstetric care were provided by physicians [27]. However, we believe that, the earlier attend to low risk women, while he latter attend to high risk and when risk developed in previously low risk obstetrician are called upon. Moreover, findings from a systematic review aimed to compare the labor and delivery care provided by certified nurse-midwives and physicians, showed that certified nurse-midwives are safe and effective [28,29]. On the other hand, a study from Allen hospital (The USA) showed that obstetrician-gynecologists are the most common caregivers for pregnant women who contributed in 74% of babies delivery in Allen hospital,[30] which is inconsistent with our findings where our nurses midwives were the core in helping in 91.6% of the child birth in this study. However, many studies emphasized the need to identify strategies to enhance effective communication between doctors and nurses as an essential requirement for promoting the quality of care and creating an excellent patient outcomes [31,32].

Regarding the use of episiotomy in this study, it was reported as much higher than other international literature. Welffens et al. [33] in his comparison of the maternal and neonatal outcomes using two methods of delivery has indicated a lower percentage of episiotomy in both used methods (6.8%and 14.5%), [33] in comparison to our findings (29.2%).Other factor was found of higher prevalence and influence the path of childbirth. A prolonged latent phase was reported in 25.0% of all births analyzed in our study which is almost similar to the findings of a recent study conducted in Sweden 23% [34]. Making childbirth safer is an important indicator of the quality of the health system which include the obstetric and gynecological services. Inadequate prenatal care and / or neglecting the causes of postpartum AEs may lead to further serious implications for the mother or her baby that include status of deaths.

Despite that primiparous women are more likely to experience a longer labor than multiparous women and that may contribute to the occurrence of AEs in mother or her newborn, our findings showed the contrary where the prevalence of AEs in mother and her newborn were reported higher among multiparous women (96.4% and 70.1%, respectively), however, this could be explained by the influence of other factors such as co-morbidity which is usually more frequent among multiparous than primiparous women [35,36].

4. LIMITATION OF THE STUDY

Although the findings of this study will create the basic knowledge about the prevalence and types of adverse events reported in a reference national hospital in Yemen, some limitations are worth to be mentioned. Almost, most mothers left the hospital after a short period of time of delivery, this period was not enough to detect other adverse events that may occur for mother or their newborns during the postpartum period.

5. CONCLUSIONS

To conclude, findings of the present study show that AEs occurrence among mothers and newborns is associated with uterine fundus pressure by the staff, multiparous mother, and frequent vaginal examination particularly among those with prolonged labor. More studies need to be conducted to ascertain the exact causative variable that results in these outcomes. Health professional should receive the necessary training to acquire the necessary skills and attitudes to recognize the importance of human factor to develop appropriate quality care and hence reducing the adverse outcomes among the mothers and newborns. More emphasis should be given to the promotion and adherence to the procedures of the best-practices on the performance of labor, improving the intervention methods for childbirth as well as the managerial environment in the obstetric department.

CONSENT AND ETHICAL APPROVAL

An official approval from the authority of Aden health office permission were obtained, as well as from the local authority of the Al Sadaka Teaching Hospital**.** A verbal consent was obtained from all participants after a brief explanation about the objectives of the study and it is importance. They were also informed that all the data collected will be handled confidentially. Any participant refused to participate was informed that she has the right to withdraw from the study at any time.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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