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Incidence and Risk Factors of Twin Pregnancy at Jimma University Specialized Hospital, Southwest Ethiopia

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Abstract

Background: The incidence of twin pregnancy is increasing all over the world because of assisted reproductive technology or spontaneously as a result of numerous risk factors. It is associated with increased risk of maternal and neonatal complications both in the developed and developing countries, which in turn increase financial, emotional, personal and social costs to the twins themselves and their families. Thus, determining its magnitude and identifying the risk factors are crucial for possible prevention and better interventions.

Method: Hospital-based prospective and case-control studies were conducted. To determine the incidence of twin pregnancy, all the 3812 deliveries conducted from December 01, 2012 to November 30, 2013 at Jimma University Specialized Hospital were followed from the time of admission to labor ward to the expulsion of fetus. To identify the risk factors for twin pregnancies, all 144 twin deliveries happened were taken as cases and 288 controls were randomly selected from the 3668 singleton-deliveries happened, with the ratio of 1:2. All the necessary data were collected by interviewing mothers, for both the cases and controls, by using structured questionnaire. The data were analyzed by using SPSS for windows version 20.0. Multivariate logistic regression analysis was done to identify risk factors for twin pregnancy. Odds ratios with 95% confidence intervals were used as measure of associations.

Results: From 3812 deliveries conducted in the year period, 144 were twins making an incidence of 37.7 per 1000 deliveries. Family history of twinning (OR=9.16, 95% CI: 4.73, 17.74), oral contraceptive pill use prior to pregnancy (OR=2.14, 95% CI: 1.12, 4.08), household monthly income of 50-100 USD (OR=1.94, 95% CI: 1.08, 3.50) and >100 USD (OR=2.18, 95% CI: 1.10, 4.33) were found to increase the risk of twin pregnancy significantly.

Conclusion: The study found high incidence of twin pregnancy. Family history of twinning, household income of ≥50 USD and oral contraceptive use prior to pregnancy were identified as risk factors for twin pregnancy. Mothers with identified risk factors should be targeted by nearby health facility in order to make the diagnosis of twin pregnancy earlier so that complications can be picked earlier and managed.

Keywords: Twin delivery; Incidence; Risk factors; Southwest Ethiopia

Abbreviations:

ANC: Antenatal Care; ART: Assisted Reproductive Technology; ETB: Ethiopian Birr;

OCP: Oral Contraceptive Pills; USD: United States' Dollar

Introduction

Twin is a type of multiple birth in which the mother gives birth to two offspring from the same pregnancy. It can be either dizygotic or monozygotic [1,2]. It is associated with increased risk of maternal and neonatal complications both in the developed and developing countries. This is probably worse in sub-Saharan Africa, where lack of facilities to manage twin delivery and poverty and harmful cultural beliefs and practices are still frequent. Available evidences also indicate that twin pregnancies are associated with increased financial, emotional, personal and social costs for the twins themselves and their families. It also accounts for at least 10% of global perinatal mortality [2-4].

Incidence of twin pregnancy is increasing all over the world. It can occur after Assisted Reproductive Technology (ART) or spontaneously. It occurs one in 80 pregnancies globally [1,2,5]. The prevalence of spontaneous twin pregnancies ranges from approximately 0.6% of pregnancies in Asia and 1-2% in Australia, Europe and the United States of America (USA) to about 4% in Africa [6].

The available literatures show that advanced maternal age, use of fertility drugs for induction of ovulation, family history of twinning, maternal height and maternal weight increase the risk of twin pregnancies. For instance, a study done in USA in 2006 found that assisted reproductive technology accounted for 18% of all twins and

advanced maternal age accounted for 25-30% of the rise in multiple birth rates since 1970 [6-8].

In Ethiopia, studies on the incidence of twin pregnancies and risk factors are very limited. The very few existing evidences show that the rates of twin pregnancy ranges from 1.4% at Mekele Referral Hospital in Tigray Region to 2.4% at St. Paul's Hospital, Addis Ababa [3,9]. Thus, conducting study to determine the incidence and identify the risk factors is very essential for program improvement. Therefore, this study aimed to fill these gaps.

Methods

Study design and setting

Hospital-based prospective and case-control studies were conducted in Jimma University Specialized Hospital (JUSH). Jimma University Specialized Hospital is located in Jimma Town 357 kms Southwest of Addis Ababa. It is one of the oldest teaching hospitals in the country giving services to people living in Jimma zone and serving as a referral hospital in the Southwest Ethiopia. It is also serving as a clinical post graduate specialty teaching hospital for Obstetrics and Gynecology, Internal Medicine, Pediatrics and Child Health since 2005 and for Ophthalmology and Surgery since 2007.

Study population

All deliveries conducted in JUSH during the study period, from December 01, 2012 to November 30, 2013, were taken as study populations to determine the incidence of twin pregnancy. For the case-control study to identify risk factors, cases were all twin deliveries conducted in JUSH during the study period and controls were randomly selected singleton deliveries. All twin pregnancies admitted to labour or maternity ward and terminated prior to gestational age of 28 weeks were excluded from this study.

Sample size and sampling techniques

The minimum required sample size to determine the incidence of twin pregnancy was determined to estimate single population proportion (incidence rate) by using Epi-Info version 7 based on the following assumptions. The expected twin delivery in Ethiopia is to be 24 per 1000 deliveries (2.4%) (p=0.024) [7]; with the allowed margin of error of 5 per 1000 deliveries (d=0.005) and 95% level of confidence. After adding 10% for non-responses, the final sample size became 3960 deliveries. In the hospital, on the average 300-350 deliveries are expected to be attended per month. With this, a period of 12 months (1 year) was proposed for the study (3960/325=12). For the case-control study to identify the risk factors, all twin deliveries (144) during the study period were taken as cases. A case to control ratio of 1:2 were considered and the first two deliveries next to the twin delivery were randomly taken as controls (288).

Data collection procedures

A pre-tested interviewer-administered structured questionnaire was developed after reviewing different related literatures to collect the data. The questionnaire, prepared in English, was translated in to

'Afan Oromo' (local language) and used to collect the data after back retranslated by other experts, who were proficient in both languages to maintain its consistency. Three Obstetrics and Gynaecology residents, one pediatrics resident, one midwife nurse and two medical interns were recruited, trained and collected the required data from the mothers just. The training was given for three days on the objective, relevance of the study, confidentiality of information, respondent's right, informed consent and techniques of interview. All completed questionnaires were reviewed each night and morning sessions were conducted every day with the data collectors to discuss on the problem encountered during data collection procedures.

Data management and analysis

The collected data were coded and entered to SPSS for windows version 20.0 for cleaning and analysis. Descriptive statistics (means and proportions) were used to describe the main features of the data. The incidence of twin delivery was expressed in rates per 1000 deliveries. Bivariate analysis was done by cross tabulation of each independent variable with the outcome to look at the existence of significant associations. Multivariate logistic regression model was used to control the effect of confounding variables and identify the risk factors. All variables having $P<0.25$ in the bivariate analysis were included in multivariable logistic regression analysis. Finally, odds ratios with 95%CI were used to show the magnitude and significance of the associations.

Ethical considerations

Before conduct of the study, ethical clearance was obtained from the College of Public Health and Medical Sciences of Jimma University. Written informed consent was obtained from every study participant before the interview by explaining the objective of the research. All the information collected from the study participants were handled confidentially through omitting their personal identification, conducting the interview in private place and using the data for the research purpose only.

Results

Incidence of twin delivery

Initially, it was planned to include a sample of 3960 deliveries in the study. However, in a year period, from December 01, 2012 to November 30, 2013, a total of 3812 deliveries were conducted in the hospital making a response rate of 96.3%. From these, 144 deliveries were twins making an incidence rate of 37.7 per 1000 deliveries.

Socio-demographic characteristics of the participants included in the case control study

Most of the study participants were, 337 (78.1%), Oromo in ethnicity, 303 (70.1%) were Muslims in religion. Almost all, 431 (99.8%), were in a marital union, 284 (65.7%) were housewives and 178 (41.2%) can't read and write. Majorities, 228 (52.8%), of the mothers were in the age group of 20-24 years. The detail comparison of these socio-demographic characteristics for cases and controls are presented in Table 1 below.

Socio-demographic variables	Cases (Twin delivery) (n=144) n (%)	Controls (Singleton delivery) (n=288) n (%)	Total (n=432) n (%)
Address of mothers			
Jimma town	43(29.9)	121(42.0)	164(38.0)
Out of Jimma town	101(70.1)	167(58.0)	268(62.0)
Age of mothers in years			
≤19	4 (2.8)	20 (6.9)	24 (5.6)
20-24	74 (51.4)	154 (53.4)	228 (52.8)
25-29	37 (25.7)	79 (27.4)	116 (27.0)
30-34	23 (16)	28 (9.7)	51 (11.8)
≥35	6 (4.2)	7 (2.4)	13 (3.0)
Ethnicity			
Oromo	107 (74.3)	230 (79.9)	337 (78.0)
Amhara	14 (9.7)	24 (8.3)	38 (8.8)
Gurage	4 (2.8)	10 (3.5)	14 (3.2)
Dawuro	8 (5.6)	9 (3.1)	17 (4.0)
Others*	11 (7.6)	15 (5.2)	26 (6.0)
Religion			
Orthodox	40 (27.8)	58 (20.2)	98 (22.7)
Protestant	9 (6.2)	22 (7.6)	31 (7.2)
Muslim	95 (66.0)	208 (72.2)	303 (70.1)
Occupation			
House wife	93 (64.6)	191 (66.3)	284 (65.7)
Employed	17 (11.8)	59 (20.4)	67 (15.5)
Farmer	26 (18.0)	30 (10.4)	56 (13.0)
Merchant	8 (5.6)	17 (5.9)	25 (5.8)
Educational status			
Cannot read and write	63 (43.8)	115 (39.9)	178 (41.2)
Read and write only	13 (9.0)	26 (9.0)	39 (9.0)
Grade 1-8	31 (21.5)	48 (16.7)	79(18.3)
Grade 9-12	22 (15.3)	50 (17.4)	72 (16.7)
>Grade 12	15 (10.4)	49 (17.0)	64(14.8)
Household monthly income ‡			
<1000 ETB (<50 USD)	58(40.3)	139 (48.3)	197(45.6)
1000-2000 ETB (50-100 USD)	59(41.0)	106 (36.5)	165(38.2)

>2000 ETB (>100 USD)	27(18.7)	44 (15.2)	71(16.4)
*Others: Tigre, Yem, Caficho ɬ ETB=Ethiopian Birr, USD=United States' Dollar			

Table 1: Socio-demographic characteristics of the cases and controls, JUSH, Southwest Ethiopia, December 2012 to November 2013.

Risk factors for twin pregnancy

Variables related to basic socio-demography, economy (income), family history of twining and OCP use were considered as risks in during the analysis of this study. After adjusting in the multivariate logistic regression model, mothers with family history of twinning and OCP users were about nine times (OR=9.16, 95% CI: 4.73, 17.74) and two times (OR=2.14, 95% CI: 1.12, 4.08) more likely with have twin pregnancy as compared to mothers with no family history of twining and non OCP users, respectively. Similarly, mothers having household monthly income of 50-100 USD and >100 USD were about two times (OR=1.94, 95% CI: 1.08, 3.50) and (OR=2.18, 95% CI: 1.10, 4.33) more likely to have twin pregnancy as compared with mothers with income of less than 50 USD (Table 2). All study participants were black by race.

Sex combination, chorionicity and zygosity of twins

147(51%) and 141 (49%) of twin births were males and females respectively giving male to female sex ratio of approximately 1:1. The sex combinations in twin deliveries were male-male in 43(29.8%), female-female 40(27.8%), male-female 38(26.4%) and female-male in 23(16%). Placental examination of twin deliveries showed that 127(88.2%) dichorionic diamniotic, 11(7.6%) diamniotic monochorionic and 6(4.2%) were monochorionic monoamniotic. According to Weinberg rule [12], monozygotic twins and dizygotic twins constituted 15.3% and 84.7% respectively (Table 3).

	25-29	37 (25.7)	79 (27.4)	2.34 (.747, 7.34)	1.74 (0.44, 6.82)
	30-34	23 (16)	28 (9.7)	4.11 (1.23, 13.73)	3.96 (0.95, 16.54)
	≥35	6 (4.2)	7 (2.4)	4.29 (0.93, 19.80)	5.23 (0.90, 30.24)
Household monthly income					
<1000 ETB (<50 USD)	89 (61.8)	220 (76.4)	1	1	
1000-2000 ETB (50-100 USD)	30 (20.8)	43 (14.9)	1.73 (1.02, 2.92)	1.94 (1.08, 3.50)	
>2000 ETB (>100 USD)	25 (17.4)	25 (8.7)	2.47 (1.35, 4.53)	2.18 (1.10, 4.33)	
Parity					
Para I	58(40.3)	139 (48.3)	1	1	
Para II-IV	59(41.0)	106 (36.5)	1.35 (0.87, 2.10)	1.42(0.81, 2.50)	
≥ Para V	27(18.7)	44 (15.2)	1.47 (0.83, 2.60)	0.72 (0.30, 1.70)	

Table 2: Risk Factors of Twin Pregnancy at JUSH, Southwest Ethiopia, December 2012 to November 2013.

Variables	Type of delivery		Crude OR (95%CI)	Adjusted OR (95%CI)
	Twin pregnancy (n=144) n (%)	Singleton pregnancy (n=288) n (%)		
OCP use prior to the current pregnancy				
Yes	34 (23.6)	30 (10.4)	2.66 (1.55, 4.56)	2.14 (1.12, 4.08)
No	110 (76.4)	258 (89.6)	1	1
Family history of twinning				
Yes	53 (36.8)	15(5.2)	10.60 (5.70, 19.71)	9.16 (4.73, 17.74)
No	91 (63.2)	273(94.8)	1	1
Age in years				
≤19	4 (2.8)	20 (6.9)	1	1
20-24	74 (51.4)	154 (53.4)	2.40 (0.79, 7.281)	2.10(0.56, 7.92)

Variable	Twin delivery	
	Number	**%**
Sex combination		
Male-male	43	29.8
Female-female	40	27.8
Male-female	38	26.4
Female-male	23	16
Chorionicity		
Dichorionic diamniotic	127	88.2
Diamniotic monochorionic	11	7.6
Monochorionic monoamniotic	6	4.2
Zygosity		
Monozygotic twins	22	15.3
Dizygotic twins	122	84.7
Like sex twins: 43+ 40=83(57.6%); unlike sex twins: 38+ 23=61(42.4%)		

Monozygotic twins=(83-61)/144=22/144 (15.3%)

Table 3: Characterization of twins by sex order, chorionicity and zygosity at JUSH from December 2012 to November 2013.

Discussion

The incidence of twin delivery in this study was 37.7 per 1000 deliveries, which is higher than other previous studies in Ethiopia such as study in Addis Ababa (24.0 per 1000 deliveries) [9], study in Mekele (13.7 per 1000 deliveries) [3] and study in Gondar (14.4 per 1000 deliveries) [10]. This finding is also higher than some African countries, like Egypt (17.7 per 1000 deliveries) [6], Sudan (20.8 per 1000 deliveries) and Benin (27.9 per 1000 deliveries) [7]. This higher figure may be explained by the fact that the hospital was giving referral service receiving cases of twin pregnancy from the surrounding health centers and hospitals.

All the study participants were from black race which may be one of the explanations for the higher incidence of twinning in this particular study when compared with studies in Asia, Australia, USA and Europe [5-7]. More interestingly, the differences in twinning rate in these four teaching hospitals of Ethiopia call for further study so as to identify whether the variation is related with ethnic groups as the cases in Nigeria [8].

All of the twins were spontaneous, with no Assisted Reproductive Technology (ART), which is similar with other African countries [1,4,11], but in contrast to that of USA, where ART accounted for 18% of all twins [5,6]. This may be because of limited ART in Ethiopia and other African countries as compared to the USA.

The risk factors for twin pregnancy identified in this study include family history of twinning, OCP use prior to pregnancy and better household income. Similar findings have been reported in previous studies in Ethiopia and other countries [6-8]. Nutrition status was not addressed in our study.

Increasing maternal age and parity have been reported as risk factors for twin pregnancies in many studies [1,7-9,11]. But in this study, increased maternal age had non-significant associations. Majority of the participants of this study, 78(54.2%), were under the age of 25 years with the mean age of the mothers at delivery 26.4 ± 5.6 years for cases and 25.4 ± 4.9 years for controls, which is relatively younger population as compared to the participants of the different studies in which the mean age of respondents was above 30 years [1,7-9,11]. The other important issue in this study is the fact that it failed to show the direct relationship between high parity and increased twinning rate. Unlike other studies [1,6,7,12], majority of twin deliveries were from low parities. For instance, 40.3% of twin births were from primiparas. Therefore, this study is challenging the general fact that advancing maternal age and high parity as risk factors of twin pregnancy and it calls for other researchers to study whether there is a change in the trend of maternal age in twin pregnancy.

Though there are different ways of determining zygosity [5,6], in this study it was determined by the Weinberg rule. This rule states that the number of monozygotic twins in a given twin population is the result of the total number of like sex twins minus unlike sex twins. The rule is based on the assumption that the total number of like sex dizygotic twins in a given large population of at least 100,000 people in a community equals that of unlike sex dizygotic twins. Therefore, the excess of the total like sex twins over total unlike sex twins will be due

to monozygotic twins [12]. Accordingly, 84.7% and 15.3% were dizygotic and monozygotic twins respectively. The rate of monozygotic twins was lower, 15.3%, in this study when compared with other studies [6,12]. This difference may be explained by the different methods used to identify zygosity among different studies.

This study found out high twining rate and associated risk factor like positive family history, cessation of oral contraception pills, and better household income .therefore, it is advisable to screen these mothers in early pregnancy for possible twin pregnancy.

For policy and program implications, this study found high incidence of twin pregnancy in the study area. This necessitates strong health care at different levels of health facilities to detect early and arrange necessary preparation including referral services for appropriate care during labor. Identifying mothers with risk factors such as family history, Oral Contraception Pill users and high wealth status for necessary investigation (such as ultrasound) for twin pregnancy is very crucial during Antenatal care visits. This study may have its own limitation in that it was conducted in one referral hospital, where most of the laboring mothers come because of complications. This might have overestimated the incidence of twin pregnancy and will not represent the general population and home deliveries that need further community based studies.

Conclusion

The incidence of twin pregnancy in this study, 37.7 per 1000 deliveries, is found to be high. Family history of twinning, house hold income and OCP use prior to pregnancy were identified as risk factors for twin pregnancy. Mothers with identified risk factors should be targeted by nearby health facility in order to make the diagnosis of twin pregnancy earlier so that complications can be picked earlier and managed.

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Authors' Contributions

TT, FA, GT involved in all processes of this research work, including conception, design, supervision of data collection, data analysis and write up of the manuscript. All authors read and approved the final manuscript.

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