

# Spontaneous Abortions in the Second Trimester of Pregnancy: Research and Analysis of Factors Associated at Laquintinie Hospital in Douala

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## Abstract

**Introduction:** Spontaneous abortion of the second trimester is an interruption of pregnancy with complete expulsion or not of the product of conception between 15 and 28 weeks of pregnancy without any maneuvers. The objective of our study was to determine the factors associated with second trimester spontaneous abortions at Laquintinie Hospital in Douala. **Methodology for this purpose:** We conducted a case-control study from January to May 2019 on pregnant women who may or may not have had spontaneous second trimester abortions. **Results:** In total we recorded 1609 pregnancies and recruited 184 patients, including 46 cases and 138 controls; which gave a frequency of spontaneous abortion in the second trimester of pregnancy of 2.85%. A correlative analysis showed that spontaneous abortions in the second trimester were associated with housewife status (OR = 2.89; CI = 1.21 - 6.79; p = 0.010), gestation > 5 (OR = 4.09; CI = 1.02 - 17.66; p = 0.040), multiparity (OR = 3.81; CI = 1.59 - 9.16; p = 0.002), history of endouterine maneuvers (OR = 5.64; CI = 2.43 - 13 .03; p = 0.000), malaria in pregnancy (OR = 3.99; CI = 1.1 - 14.76; p = 0.030), incompleteness on the second trimester ultra-



sound (OR = 2.37; CI = 1.18 - 4.70;  $p = 0.010$ ), jolts when traveling (OR = 46.04; CI = 17.29 - 123.66;  $p = 0.000$ ), long car journeys (OR = 7.05; CI = 1.99 - 27.77;  $p = 0.000$ ). After logistic regression eliminating the confounding factors, only the following were associated with abortions: Multiparity (OR = 13.90; CI = 2.96 - 65.18;  $p = 0.000$ ), endo uterine maneuvers (OR = 3.69; CI = 1.01 - 13.44;  $p = 0.047$ ), jolts when traveling (OR = 72.63; CI = 19.47 - 270.96;  $p = 0.000$ ), long car journeys (OR = 15.41; CI = 2.7 - 85.95;  $p = 0.000$ ). Conclusion: Our study reveals that a set of factors contribute to the occurrence of spontaneous abortions in the second trimester of pregnancy in our context.

## Keywords

Spontaneous Abortion, Second Trimester, Associated Factors, Laquintinie

## 1. Introduction

Abortion according to the World Health Organization is defined as a termination of pregnancy with or without complete expulsion of the product of conception before 22 weeks of pregnancy or where the fetus weighs less than 500 g [1]. In our context, abortion is the termination of pregnancy before 196 days or 28 weeks of pregnancy, the date from which the viable child born alive is supposed to be able to develop and live to an advanced age [2]. Second trimester abortion is a termination of pregnancy that occurs between 15 and 28 weeks of pregnancy [3]. Depending on the mechanism of occurrence, two types of abortion are distinguished: Spontaneous abortion (which occurs on its own outside of any local or general voluntary enterprise) and induced abortion (which occurs following any maneuvers intended to terminate the pregnancy) [4]. According to gestational age, abortions are distinguished into: Early abortion (when it occurs during the first trimester of pregnancy before the fifteenth week of pregnancy) and late abortion (when it occurs during the second trimester of pregnancy between 15 and 28 weeks of pregnancy) [3].

Spontaneous abortion in the second trimester is rare but should be considered an important event in a woman's obstetric history. The literature reports varying prevalence depending on the series and countries with a prevalence of 2.1% in the United States in 2015 [5], and 1.7% in Denmark in 2014 [6]. Spontaneous abortion in the second trimester affected 2% to 3% of all recognized pregnancies in England in 2012 [7] and 1% to 2% of all recognized pregnancies in Australia in 2010 [8], with a prevalence of 1.3% in Burkina Faso in 2003 [9]. In Cameroon, Melon *et al.* in 2018 at the Gyneco-Obstetric and Pediatric Hospital of Yaoundé found a rate of factors associated with spontaneous abortions in the second trimester of pregnancy of 4.4% [10].

Most studies have considered spontaneous abortions as a whole and few have focused on late-term spontaneous abortions; nevertheless, several causes of spontaneous second trimester abortion have been identified: uterine abnormali-

ties, immunological problems, hormonal imbalances, infections and fetal anomalies, obstetric history, history of pelvic inflammatory disease, advanced age of the mother, specific occupations or exposure to work and smoking habits [11]. It has been established that chromosomal abnormalities are less common in late-term abortions than in first-trimester abortions suggesting that the cause is primarily maternal in origin [12].

In Cameroon, we have little data on the factors associated with the second trimester spontaneous abortions. Thus justifying the present study whose medium and long term objective is operational.

## 2. Methodology

### 2.1. Type, Location, Period and Duration of the Study

This was a case-control study with prospective data collection carried out in the obstetrics and gynecology department of Laquintinie Hospital from January 7, 2019 to May 10, 2019, *i.e.* a duration of 4 months.

### 2.2. Patients and Material

#### 2.2.1. Study Population

Any woman in the second trimester of pregnancy presenting a spontaneous abortion for the cases and those who did not have a spontaneous abortion in the second trimester for the controls and all seen in consultation at the Laquintinie Hospital in Douala during the study period.

#### 2.2.2. Sampling

The cases were chosen consecutively and for each case included, three controls were matched. In order to ensure that the size of our sample is required for the various statistical analyses, the calculation of the minimum sample size was done using the Schlesselman formula [13]:

$$n = \left( \frac{r+1}{r} \right) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha_2})^2}{(p_1 - p_2)^2}$$

$n$  = sample size;

$r$  = ratio of women with a second trimester abortion/ratio of women in the third trimester of pregnancy: 3/1;

$p_1$  = proportion of the main factor in group 1;

$p_2$  = proportion of the main factor in group 2;

$\bar{p}$  =  $(p_1 + p_2)/2$  = average of proportions;

$p_1 - p_2$  = the difference between the proportions;

$Z_{\alpha}$  = standardized significance level = 1.96;

$Z_{\beta}$  = standardized power = 0.84.

Digital application: We used data from the study conducted by Melon in 2018 on factors associated with second trimester spontaneous abortions. The factor considered here is the history of spontaneous abortion in the second trimester [10].

$$P_1 = 23.9;$$

$$P_2 = 2.8;$$

$$\text{Thus: } P = (p_1 + p_2)/2 = (23.9 + 2.8)/2 = 13.35\% = 0.1335.$$

Our difference in proportions was  $p_1 - p_2 = 23.9 - 2.8 = 21.1\% = 0.211$  and  $r = 3$ .

$$N = \frac{1.33(0.1335)(1-0.1335)(7.84)}{0.0515} = 23.42$$

The minimum size required for this study was 24 for the case group and 72 for the control group.

## 2.3. Criteria

### 2.3.1. Inclusion Criteria

Any woman who had an abortion between 15 and 28 weeks of pregnancy and consulted at the Laquintinie Hospital in Douala during the study period after informed consent.

Case group: Any woman having an abortion between the 15th and 28th week of pregnancy and seen in consultation at the Laquintinie Hospital in Douala during the study period after informed consent.

Control group: Any pregnant woman in the second trimester of pregnancy in prenatal consultation at Laquintinie Hospital in Douala during the study period after informed consent.

### 2.3.2. Exclusion and Non-Inclusion Criteria

- Pregnant women less than 15 weeks gestation.
- Women who have had a voluntary termination of pregnancy.

### 2.3.3. Non-Inclusion Criteria

- Women eligible but refusing to participate in the study.

The study variables were:

- Sociodemographic:
  - Age in years.
  - Level of study: divided into four categories (none, primary, secondary and higher).
  - The type of occupation: divided into public sector, private sector, informal sector, pupil or student, housewife, trader and other professions.
  - Marital status: divided into five classes (married, single, concubine, divorced, and widowed).
  - The region of origin.
  - Religion (Catholic, Protestant, Muslim, animist, others).
  - The nationality.
- Clinical and obstetrical:
  - + Personal and family history.
  - The gravida formula.
  - Date of last period.
  - History of abortion.
  - Spontaneous bleeding.

- Strapping.
- Consumption of alcohol and tobacco.
- Hypertension, Diabetes.
- Endouterine maneuvers: curettage.
- Previous premature birth.
- Close pregnancy with short birth interval.
- Family history of abortion.
- History of malformation.
- History of STIs.
- + Current pregnancy:
  - Desired pregnancy.
  - Gestational age.
  - Pregnancy monitored.
  - Number of prenatal consultations.
  - Concept of malaria.
  - Weight gain.
  - Examinations carried out.
- Lifestyle:
  - Place of residence.
  - Transport conditions: jolts, vibrations, long car journeys, long daily walking journeys.
  - Strong emotions: failures, death, stress, external work.
  - Tobacco abuse.
  - Housing condition: absence of elevator for women living or working on high floors, stairs.
  - Practicing physical activity.
  - Number of current sexual partners.
  - Food habit.
  - Medications used on a daily basis.

## 2.4. Statistical Analysis

The data for the study were collected using a structured and pre-tested questionnaire; they were then entered and analyzed using SPSS software version 20.0 and Epi Info 3.5.4. The comparison of variables was carried out using tests Chi square and Fischer exact. The error threshold was set at 5% as statistically significant for each variable studied. The association between the variables and the disease was made using the odds ratio (or Odds Ratio) expressed with its 95% confidence interval. Logistic and linear regression were performed to eliminate confounding factors.

## 3. Results

### 3.1. Frequency of Second Trimester Spontaneous Abortions

During our study period, we recruited 46 abortion cases matched to 138 controls

out of a total of 1609 pregnancies, or a frequency of 2.85%.

### 3.2. Sociodemographic Factors

The age of the women ranged from 15 to 45 years, with a mean of 29.34 years and a standard deviation of 6.65 years in the case group, and 28.34 years and a standard deviation of 6.13 years in the control group. We did not find a statistically significant association for the age factor (**Table 1**)

**Table 1.** Distribution of cases and controls according to the age group of patients.

Age	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
[15 - 20]	3 (6.5)	10 (7.2)	0.89 (0.19 - 3.25)	0.580
[20 - 25]	9 (19.6)	31 (22.5)	0.84 (0.35 - 1.9)	0.430
[25 - 30]	13 (28.3)	48 (34.8)	0.74 (0.35 - 1.53)	0.270
[30 - 35]	8 (17.4)	26 (18.8)	0.91 (0.36 - 2.14)	0.510
[35 - 40]	10 (21.7)	17 (12.3)	1.98 (0.8 - 4.68)	0.100
[40 - 45]	3 (6.5)	6 (4.3)	1.53 (0.3 - 6.42)	0.400

The majority of women with second trimester spontaneous abortion were housewives. This variable was 3 times significantly associated with the occurrence of spontaneous abortion in the second trimester (**Table 2**)

**Table 2.** Distribution of cases and controls according to profession.

Profession	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
Student/Pupil	10 (21.7)	50 (36.2)	0.49 (0.22 - 1.06)	0.50
Housewife	12 (26.1)	15 (10.9)	2.89 (1.21 - 6.79)	0.10
Public sector	4 (8.7)	14 (10.1)	0.84 (0.23 - 2.60)	0.520
Private sector	13 (28.3)	40 (29.0)	0.97 (0.45 - 2.01)	0.540
Trader	6 (13.0)	13 (9.4)	1.44 (0.48 - 4)	0.330
Peasant	0 (0)	5 (3.6)	0 (0 - 2.45)	0.230
Little independent	1 (2.2)	1 (0.7)	3.04 (0.08 - 119.51)	0.440

Likewise, multiple gestation beyond 5 pregnancies and multiple parity beyond 3 deliveries were statistically associated with spontaneous abortions in the second trimester of pregnancy, with an exposure risk of 4 (**Table 3**).

A history of endouterine maneuvers was a risk factor statistically associated with spontaneous abortion in the second trimester with an exposure risk of 5.64 (**Table 4**).

Among the data from the current pregnancy: only malaria during pregnancy was significantly associated with the occurrence of spontaneous abortion in the second trimester with an exposure risk of 4 (**Table 5**).

**Table 3.** Distribution of cases and witnesses according to gestation and parity.

Gestation and Parity	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
<b>Gestation</b>				
1	11 (23.9)	51 (37.0)	0.54 (0.24 - 1.14)	0.070
2	13 (28.3)	22 (15.9)	2.08 (0.92 - 4.55)	0.050
3	7 (15.2)	30 (21.7)	0.65 (0.25 - 1.55)	0.230
4	6 (13.0)	20 (14.5)	0.89 (0.31 - 2.30)	0.510
5	4 (8.7)	11 (8.0)	1.10 (0.29 - 3.54)	0.540
>5	<b>5 (10.9)</b>	<b>4 (2.9)</b>	<b>4.09 (1.02 - 17.66)</b>	<b>0.040</b>
<b>Parity</b>				
<3	33 (71.7)	125 (89.3)	0.30 (0.13 - 0.71)	0.008
≥3	<b>13 (28.3)</b>	<b>13 (9.3)</b>	<b>3.81 (1.59 - 9.16)</b>	<b>0.002</b>

**Table 4.** Distribution of cases and controls according to other obstetric history.

Variables	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
<b>Spontaneous bleeding of the first trimester</b>	8 (17.4)	19 (13.8)	1.32 (0.51 - 3.22)	0.350
Still birth	1 (2.2)	6 (4.3)	0.49 (0.02 - 3.44)	0.440
Prematurity	10 (21.7)	21 (15.2)	1.55 (0.64 - 3.56)	0.210
<b>Endo uterine Maneuvers</b>	<b>17 (37.0)</b>	<b>13 (9.3)</b>	<b>5.64 (2.43 - 13.03)</b>	<b>0.000</b>
Curetage	5 (10.9)	18 (13.0)	0.81 (0.26 - 2.26)	0.460
<b>Manual aspiration</b>	8 (17.4)	19 (13.8)	1.32 (0.51 - 3.22)	0.350

**Table 5.** Distribution of cases and controls according to the characteristics of the current pregnancy.

Current pregnancy	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
<b>Desired pregnancy</b>	38 (82.6)	115 (83.3)	0.95 (0.40 - 2.43)	0.540
<b>Followed pregnancy</b>	33 (71.7)	111 (80.4)	0.62 (0.29 - 1.37)	0.150
<b>Malaria in pregnancy</b>	<b>6 (13.04)</b>	<b>5 (3.6)</b>	<b>3.99 (1.10 - 14.76)</b>	<b>0.030</b>
Treatment of malaria				
<b>Ambulatory</b>	0 (0)	16 (11.6)	0 (0 - 0.57)	0.010
<b>Hospitalisation</b>	4 (8.7)	28 (20.3)	0.37 (0.11 - 1.07)	0.050
Type of pregnancy				
<b>Mono fetal</b>	43 (93.5)	120 (87.0)	2.15 (0.65 - 9.52)	0.180
<b>Multiple</b>	3 (6.5)	17 (12.3)	0.50 (0.11 - 1.66)	0.210

## Continued

Number of ANC				
[0 - 2]	18 (39.1)	53 (38.4)	1.03 (0.51 - 2.04)	0.530
[3 - 4]	23 (50.0)	67 (48.6)	1.06 (0.54 - 2.08)	0.500
>4	5 (10.9)	17 (12.3)	0.87 (0.27 - 2.43)	0.510
Blood group				
O	24 (52.2)	64 (46.4)	1.26 (0.64 - 2.48)	0.300
A	14 (30.4)	37 (26.8)	1.19 (0.56 - 2.47)	0.380
B	5 (10.9)	26 (18.8)	0.53 (0.17 - 1.40)	0.150
AB	2 (4.3)	5 (3.6)	1.21 (0.16 - 6.35)	0.560
None	1 (2.2)	6 (4.4)	0.49 (0.02 - 3.40)	0.440
Rhesus				
Positive	44 (95.7)	132 (95.7)	1 (0.2 - 7.42)	0.640
Negative	1 (2.2)	0 (0)	/	0.250
Recent abdominal trauma	0 (0)	1 (0.7)	0 (0 - 57)	0.750
Traditional medication	2 (4.3)	16 (11.6)	0.35 (0.05 - 1.39)	0.120

Incompleteness of second trimester ultrasound was significantly associated with almost twice the risk of spontaneous abortions in the second trimester (Table 6).

**Table 6.** Distribution of cases and controls according to exams carried out or not.

Examines carried out or not	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
Second trimester echography done	23 (50)	97 (70.3)	0.42 (0.21 - 0.85)	0.010
Length of cervix > 2.5	0 (0)	9 (6.5)	0 (0 - 1.15)	0.070
Second trimester echography not done	23 (50)	41 (29.7)	2.37 (1.18 - 4.70)	0.010
PCV	0 (0)	2 (1.4)	0 (0 - 10.46)	0.560

Long car trips were statistically associated with spontaneous abortions in the second trimester, increasing the risk by 7, as well as shaking during transport, increasing the risk by 46 times (Table 7).

In multivariate analysis, Housewife, Gestity > 5, Parity ≥ 3, Endouterine maneuvers, Malaria during pregnancy, second trimester ultrasound not done, shaking Long car journey were associated with spontaneous abortions in the second quarter

But after logistic regression to eliminate confounding factors, only Parity ≥ 3 Endo-uterine maneuvers, shaking, and long car journeys were associated with the occurrence of 2nd trimester abortions (Table 8 and Table 9).



**Table 7.** Distribution of cases and controls according to transport conditions.

Transport conditions	Cases	Controls	OR (CI 95%)	P-value
	n = 46 (%)	n = 138 (%)		
Taxis	46 (100)	120 (87)	/	0.000
Motocycles	46 (100)	130 (94.2)	/	0.100
Long walk	7 (15.2)	34 (24.6)	0.55 (0.21 - 1.31)	0.130
Jerks	<b>34 (73.9)</b>	<b>8 (5.8)</b>	<b>46.04 (7.29 - 123.66)</b>	<b>0.000</b>
Long car ride	<b>8 (17.39)</b>	<b>4 (2.9)</b>	<b>7.05 (1.99 - 27.77)</b>	<b>0.000</b>

**Table 8.** Summary of significant variables.

	Cases	Controls	OR (CI 95%)	P-value
	N = 46 n (%)	N = 138 n (%)		
Housewife	12 (26.1)	15 (10.9)	<b>2.89 (1.21 - 6.79)</b>	<b>0.010</b>
Gravidity>5	5 (10.9)	4 (2.9)	<b>4.09 (1.02 - 17.66)</b>	<b>0.040</b>
Parity ≥ 3	13 (28.3)	13 (9.3)	<b>3.81 (1.59 - 9.16)</b>	<b>0.002</b>
Endo uterine maneuvers	17 (37.0)	13 (9.4)	<b>5.64 (2.43 - 13.03)</b>	<b>0.000</b>
Malaria in pregnancy	6 (13.0)	5 (3.6)	<b>3.99 (1.1 - 14.76)</b>	<b>0.030</b>
Second trimester echography not done	23 (50.0)	41 (29.7)	<b>2.37 (1.18 - 4.7)</b>	<b>0.010</b>
Jerks	34 (73.9)	8 (5.8)	<b>46.04 (17.29 - 123.66)</b>	<b>0.000</b>
Long car ride	8 (17.4)	4 (2.9)	<b>7.05 (1.99 - 27.77)</b>	<b>0.000</b>

**Table 9.** Logistic regression.

	OR (adjusted)	P-value (adjusted)
<b>Housewife</b>	0.41 (0.09 - 1.81)	0.240
<b>Gravidity &gt; 5</b>	0.73 (0.07 - 3.47)	0.360
<b>Parity ≥ 3</b>	<b>13.90 (2.96 - 65.18)</b>	<b>0.000</b>
<b>Intra uterine maneuvers</b>	<b>3.69 (1.01 - 13.44)</b>	<b>0.047</b>
<b>Malaria in pregnancy</b>	0.59 (0.07 - 4.80)	0.620
<b>Echography not done</b>	3.13 (0.94 - 10.44)	0.060
<b>Jerks</b>	<b>72.63 (19.47 - 270.96)</b>	<b>0.000</b>
<b>Long car ride</b>	<b>15.41 (2.7 - 85.95)</b>	<b>0.000</b>

#### 4. Discussion

Our study made it possible to measure the importance of the potential determinants of spontaneous abortions of the second trimester in an urban context and specifically at the Laquintinie Hospital in Douala.

The choice of this site is reasonable due to its high patient base covering the majority of socio-economic strata of Cameroon but also its high delivery rate in the city of Douala.

The collection of information on the different risk factors was prospective, so that the case or control status was known at the time of collection, which, in our opinion, helped to avoid selection bias.

#### 1) Frequency of second trimester spontaneous abortions

The data in the literature are disparate and do not allow a relevant comparative analysis of this variable due to differences in inclusion criteria, sample size and duration of studies.

In our study, the proportion of spontaneous abortions in the second trimester was 2.85%. It is neither similar nor superimposable to that of the African series that have dealt with the subject; namely Assebouya *et al.*, in Burkina Faso 1.3% [9], Melon in Cameroon 4.4% [10].

Our frequency is closer to Hawkins *et al.*, in the United States 2.1% [5], but far from Yamada *et al.*, in Japan 0.9% [14].

#### 2) Sociodemographic factors associated with second trimester spontaneous abortions.

The sociodemographic characteristics studied were: age, marital status, profession, region of origin, age of spouse, and level of education. Only housewife occupation was a factor associated with second trimester spontaneous abortions.

##### Maternal age:

Unlike Abeysena (OR 2.98; 95% CI = 1.07 - 8.26) and Ancel, (OR = 8.8, 95% CI = 2.5 - 30.7) [15] who found a strong association between maternal age and the occurrence of spontaneous abortions in the second trimester, this variable was not significantly associated in our case series.

For these authors, the respective ages of 35 and 40 were strongly associated; the duration and therefore, the size of our sample of cases seems to us to explain this default difference in statistical power linked to size.

##### The profession:

Being a housewife was a risk factor statistically associated with second trimester spontaneous abortions (OR = 2.89; 95% CI = 1.21 - 6.79). She was exposed almost 3 times to spontaneous abortions in the second trimester. These data agree with those of Samaraweera *et al.*, in Australia in 2010 found that this profession exposed almost 3 times to the risk of spontaneous abortion in the second trimester (OR = 2.85; 95% CI = 1.45 - 5.6) [16], those of Melon in Cameroon in 2018, and Ancel *et al.*, in 2000 who found that unemployed women would have twice the risk of spontaneous abortion in the second trimester, *i.e.* (OR = 2.02; 95% CI = 1.02 - 3.94) [10] and (OR = 2.3; 95% CI = 1.4 - 3.6) [15].

The household variable is usually complex in our environment because it equates to poor social class and all those, although qualified and sometimes in the middle class, do not find a job or have self-employed employment.

However, the housewife in the sense of a deprived class is a source of incompleteness at prenatal visits, of physical efforts incompatible with the state of pregnancy, of long walks; all things that constitute the mask for spontaneous second trimester abortions in our resource-limited environment

#### 3) Clinical and obstetric factors associated with second trimester spontaneous

abortions.

The clinical and obstetric factors related to spontaneous abortions of the second trimester found in this study were: Multigravidity, multiparity, endouterine maneuvers, malaria during pregnancy, and second trimester ultrasound not done.

**Multigravidity:**

We found a risk of spontaneous abortion in the second trimester almost 4 times higher in patients who had more than 5 pregnancies (OR = 4.09; 95% CI = 1.02 - 17.66; P = 0.040). These results were consistent with those of Teguede *et al.*, in Mali in 2012, who demonstrated that having more than five pregnancies was a risk factor for spontaneous abortions in the second trimester (OR = 1.33; 95% CI = 1.12 - 1.59) [17] and those of Melon in Cameroon in 2018, it was found that unemployed women would have 3 times the risk of spontaneous abortion in the second trimester, *i.e.* (OR = 2.83; 95% CI = 1.1 - 7.02) [10].

The occurrence of cervical trauma during a previous pregnancy as well as its multiplicity are all factors reported in the literature as leading to abortion.

**Multiparity:**

The multiplication of events at the level of the cervix leads to its softening, causing acquired cervical incompetence responsible for spontaneous abortions in the second trimester.

In our study, multiparity would statistically significantly increase the risk of having a spontaneous abortion in the second trimester (OR = 3.81; 95% CI = 1.59 - 9.16; P = 0.002), thus agreeing with the findings of other authors [6] [10] [18].

**Endouterine maneuvers:**

As it is with multigravidity and multiparity, so is it with endouterine maneuvers. These obstetric events damage and weaken the cervix, responsible for acquired cervical incompetence leading to spontaneous abortion of the second trimester.

Endouterine maneuvers were a risk factor statistically associated with second trimester spontaneous abortion (OR = 2.27; 95% CI = 1.14 - 4.46). They were almost twice as likely to have spontaneous abortions in the second trimester. These data match those of Melon in Cameroon in 2018 found (OR = 2.27; 95% CI = 1.14 - 4.46) [10] and those of Ancel *et al.*, in 2000 (OR = 3; 95% CI = 1.1 - 7.9) [15].

**The concept of malaria in pregnancy:**

In our study, malaria would statistically significantly increase the risk of having a second trimester spontaneous abortion 4 times (OR = 3.99; 95% CI = 1.1 - 14.76). This result is similar to that of McGready *et al.* (OR = 4.09; 95% CI = 1.48 - 16.86) in 2012, who found that symptomatic malaria patients were exposed to a high risk of abortion.

Two explanations for the occurrence of this gestational failure: anemia in pregnancy and more so malaria is a frequent cause of abortion in our context as much as the growth retardation that it induces without forgetting that any fe-

brile state in pregnancy causes a release of cytokines including prostaglandins which are utero tonics, thereby inducing contractions.

Ultrasound not done in the second trimester:

In our study, non-completeness of the second trimester ultrasound would statistically significantly increase twice the risk of having a spontaneous second trimester abortion (OR = 2.37; 95% CI = 1.18 - 4.7).

This aspect does not seem direct to us and would rather be the result of a set of failures, namely a lack of financial resources resulting in poor monitoring of the pregnancy.

4) Lifestyle factors associated with second trimester spontaneous abortions.

Lifestyle factors related to second trimester spontaneous abortions found in this study were: jolts during transport, long car journeys.

Shaking during transport and long car journeys during pregnancy:

Jolting during transport was a risk factor statistically associated with second trimester spontaneous abortion (OR = 46.04; 95% CI = 17.29 - 123.66). She was at almost 46 times the risk of spontaneous abortions in the second trimester. These data match those of Melon which found OR = 11.18; 95% CI = 3.51 - 41.32 [10].

The same was true for long car journeys during pregnancy; they statistically significantly increased the risk of spontaneous abortion in the second trimester in our series (OR = 7.05; 95% CI = 1.99 - 27.77). They were almost 7 times at risk of spontaneous abortions in the second trimester. These data agree with those of Melon which found OR = 3.59; 95% CI = 1.83 - 6.98 [10].

Jolts during pregnancy as well as long journeys are sources of maternal physical overwork; itself a known factor in second-trimester abortion

## 5. Conclusion

Our study reveals that a set of factors contribute to the occurrence of spontaneous abortions in the second trimester of pregnancy in our context; in particular Multiparity, endo uterine maneuvers, jerks when traveling, and long car journeys.

## Contribution to Science

Our study made it possible to measure the importance of the potential determinants of spontaneous abortions of the second trimester in an urban context and specifically at the Laquintinie hospital in Douala, thus opening the way to an operational approach in terms of advice during prenatal visits.

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## Contribution of Authors

Essome: coordinated the study and wrote the manuscript.

Ngoumi: collected the data.

Tocki: provided the English translation and formatting of the manuscript.

Boten, Ndolo, Ofakem, Bilkissou, Ngaha, Mouchikpou, Ngono, Mangala, Ngalame, Tchounzou; Ekono read and corrected the manuscript.

Nana and Foumane supervised the study and corrected the manuscript.

All authors read and validated the final manuscript.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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