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The Study of Existing Associations between Overweight and Post-Natal Complications Prospective Cohort Study at Souissi Maternity Hospital in Rabat

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ABSTRACT

Objective of the study: The objective of this research was to study the existing associations between overweight and post-natal complications recorded among the women who have given birth at the Souissi maternity hospital in Rabat. **Materials and Methods:** This is a descriptive prospective longitudinal cohort study conducted over a period of 9 months from March to November 2018, at the Souissi maternity hospital in Rabat. Including those who had an uncomplicated pregnancy, the number of cases recruited was 1002 cases. With a response rate of 93.31% and using a mixed questionnaire, the number of women surveyed was 935 cases, subdivided into two groups. The group of women with normal corpulence of 637 cases vs. the group of women with overweight of 298 cases. **Results:** This work showed the existence of associations between the appearance of the following complications and the overweight: breast engorgement [RR=1.478, 95% CI [1.183-1.185], 0.001]; breast lymphangitis [RR=1.789, 95% CI [1.149-2.784], 0.035], and postpartum depression [RR=0.597, 95% CI [0.386-0.924], 0.011]. **Conclusion:** The results of this study demonstrated the existence of associations between the overweight and the post-natal complications recorded among the women included in this study, revealing, thus, the importance of taking into consideration this Body Mass Index class when treating any pregnant woman at the level of the different health care structures. The ultimate goal is to reduce post-natal maternal morbidity, and consequently maternal mortality at the national level.

INTRODUCTION

For decades, the reduction of maternal mortality has been the focus of several international conferences [1]. Giving rise to the policies that helped in reducing the global maternal mortality ratio by two-thirds between 1990 and 2015 [2].

Nevertheless, these achievements are not unanimous for all countries of the world. The majority of current deaths occur in low-income countries [3]. Specifically, 99% of global deaths occur in low-income countries, with more than half in Africa and nearly a third in South Asia [4]. Indeed, the maternal mortality ratio in developing countries is 239 deaths per 100,000 live births. In contrast, the ratio in developed countries is only 12 deaths per 100,000 live births [5].

Like developing countries, Morocco still has a high maternal mortality rate. During the last two decades, the Moroccan Ministry of Health has taken action to reduce maternal mortality to 50 deaths per 100,000 live births by the end of 2015 [6]. 6] However, according to the 2017 National Population and Family Health Survey, the current maternal mortality ratio is 72.6 deaths per 100,000 live births.

The direct obstetric causes of maternal mortality in Morocco are mainly hemorrhage, hypertensive pathologies, infection, and thromboembolic complications [8]. The majority of deaths due to these causes are preventable. Moreover, nearly 8 out of 10 deaths are associated with problems in health care structures. In particular, under-evaluation of severity in 43%; delay or misdiagnosis in 35%; and delay in care at the health service level in 30% [8]. To remedy these situations, the recommendations of the Confidential Maternal Death Survey report the need to establish and implement rigorous protocols for monitoring pregnant women for the most common etiologies of these obstetric complications [8].

Goffman et al found that women with a BMI more than normal have a high risk of death or of suffering severe complications during pregnancy than women with normal corpulence [9]. This finding has been confirmed by several studies, including the Alanis et al study, which found that obesity is a potential risk factor for obstetrical complications [10]. Thus attesting to the importance of calculating the Body Mass Index for each pregnant woman, in order to avoid the under-evaluation of serious pregnant situations, and as a corollary offer cares adapted to the needs.

Because of these findings and the social and economic consequences of maternal mortality and morbidity [11], this study aimed to study the existing associations between overweight and post-natal complications recorded among women who have given birth at the Souissi maternity hospital in Rabat.

MATERIAL AND METHOD

This is a descriptive prospective longitudinal cohort study carried out over a period of 9 months from March to November 2018, at the Souissi maternity hospital in Rabat.

2.1 Inclusion criteria

Women who received prenatal care, who had an uncomplicated pregnancy, who have given birth at the Souissi maternity hospital in Rabat, and who expressed their agreement to participate in this study, regardless of their age and origin, were included in this study.

2.2 Exclusion Criteria

Excluded from this study were women with high-risk pregnancies, women who withdrew from the study during the specified observation period, and those who refused to participate in the survey.

2.3 Data collection

This study conducted through a mixed questionnaire on:

- Socio-demographic data of the births, such as age; provenance; the level of education of the women; medical coverage.
- Medical information: parity; term of pregnancy; mode of delivery; delivery process.
- Data on postnatal complications: These concern symptoms indicative of these complications, having been verified according to contacts with the women who have given birth, according to the following schedule:
- At 12 hours of hospitalization.
- A 24-hour hospital stay.

- At 9 days after delivery.
- At 42 days postpartum.

Contact with the surveyed was either direct or by telephone, depending on the case.

To have the same investigator, we recruited during working hours.

The study was completed by analyzing and extracting additional information using the medical documents of the women who had given birth.

2.4 Ethical consideration

The Ethics Committee of the Faculty of Medicine and Pharmacy of Rabat and the administration of the Souissi Maternity Hospital of Rabat have given their approval for the realization of this study. Informed consent was obtained from each woman at the time of entry into the study. Participation in the study was free of charge, respecting confidentiality and anonymity.

2.5 Some definitions

2.5.1 Postnatal period

By the postnatal period, this work considered the period from the end of childbirth to 42 days postpartum.

2.5.2 Post-natal complications

This study grouped complications of the post-natal period into five categories, namely: bleeding complications; infectious complications; breast complications; thromboembolic complications; and psychological complications.

2.5.3 The normal corpulence

Referring to the World Health Organization classification, women with normal corpulence are those with a Body Mass Index between [18.5 kg to 25 kg] [12].

2.5.4 The overweight

Referring to the World Health Organization classification, overweight women are those with a Body Mass Index between [25Kg to 30Kg] [12].

2.5.5 The study level of the women who have given birth

In order to analyze the study level of a woman who has given birth, this work has subdivided the levels of study into eight categories; Illiterate; M'Cid or Koranic school; Primary; Secondary; High school; Superior 1st cycle; Superior 2^{nd} cycle; Superior 3^{rd} cycle.

2.6 Statistical analysis

The data collected was coded and subjected to computerized analysis using SPSS V20 software. Quantitative variables were expressed as means and standard deviations, and qualitative variables as percentages. The comparisons used were the Student t-test for quantitative variables and the Pearson Chi2 test for qualitative variables. P values less than 0.05 were considered statistically significant. The significance of each variable association was assessed using relative risk (RR) values, and its probability ($PX^2 < 0.05$), with the calculation of the 95% confidence interval (95% CI). The null hypothesis = there is independence between the postnatal complications and the overweight women. The alternative hypothesis = there is a dependency between the post-natal complications and the overweight women.

RESULTS

3.1 Study Flow Chart

Among the 13041 deliveries realized at the Souissi maternity hospital in Rabat, between March and November 2018, this study recruited 1002 deliveries, i.e. 7.68% of the number of deliveries. Between the women recruited, there were 29 cases of loss of sight; that is 2.89% of recruited cases and 38 women refused to continue the study; that is 3.79% of the sample. As a result, the number investigated was 935 cases; divided into two groups. The group of women with normal corpulence (n=637 cases), and the group of overweight women (n=298 cases). (**Figure 1)**

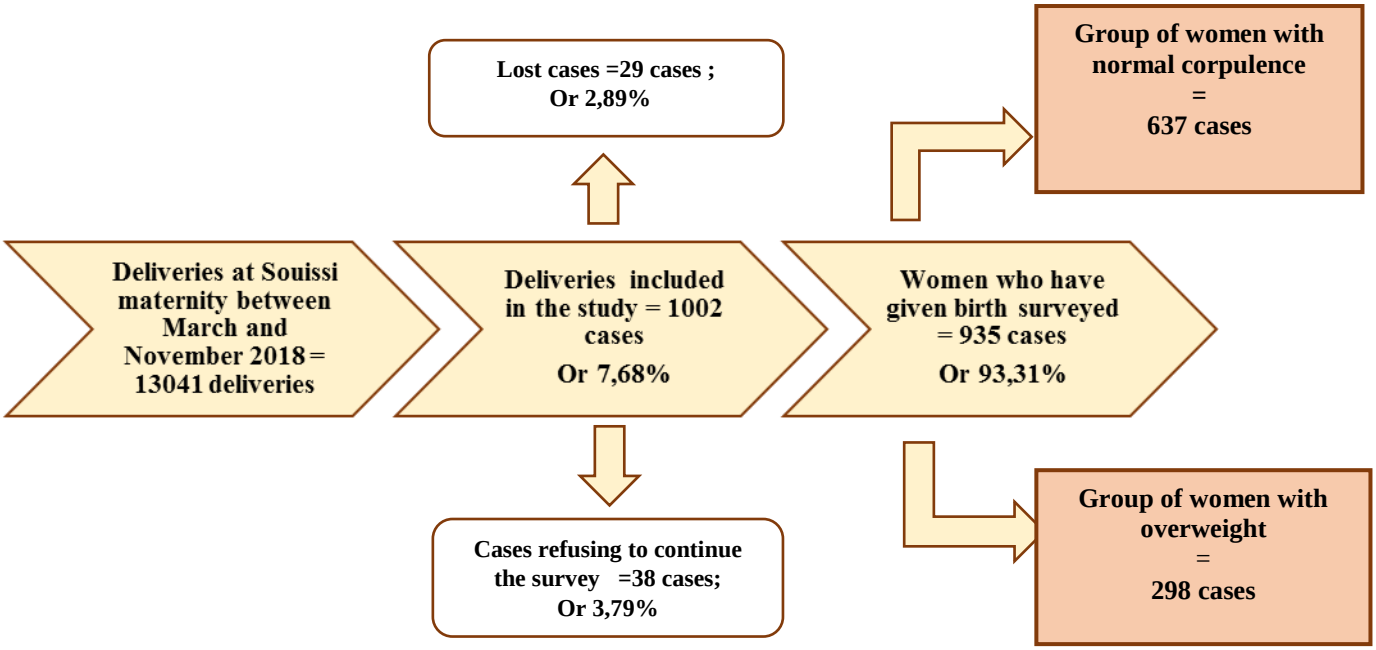

Figure No. 1: Summary of the flow of case participating in the study

3.2 Socio-demographic characteristics of the parturient included in this study

According to the results of the survey of 935 women who have given that met the inclusion criteria, the average age of women with normal corpulence was 23.982± 4.314, with 53.69% in the age group [30 years, 40 years]. The origin of this group was urban in 61.54% and rural in 32.81%. The study level of these women was a college in 34.07% and primary school in 28.10%. 80.22% said they had medical coverage. Also, the results showed that the average age of the overweight women was 26.802± 5.015, with 64.09% having age between [20, 30 years old]. Their origin was urban in 50.67% and rural in 39.26%. The study level of this group was a primary school in 29.53%, college in 28.86%, and higher in 12.42%. They had medical coverage in 77.52% of cases. **(Table1)**.

Table No. 1: Socio-demographic characteristics of the parturient included in this study

	Surveyed cases N= 935			
	Normal corpulence n= 637		**Overweight n= 298**	
Variables	**Effective**	**Percentage (%)**	**Effective**	**Percentage (%)**
Age range (mean± SD)	23,982± 4,314		26,802± 5,015	
< 20 years old	87	13,66	13	4,36
[20s, 30 years old [	203	31,87	191	64,09
[30, 40 years old]	342	53,69	89	29,87
>40 years old	5	0,78	5	1,68
Provenance				
Urban	392	61,54	151	50,67
Rural	209	32,81	117	39,26
Suburban	36	5,65	30	10,07
Study level of the woman who have given birth				
Illiterate	12	1,88	10	3,36
M'Cid or Koranic school	00	00	00	00
Primary	179	28,10	88	29,53
College	217	34,07	86	28,86
High school	161	25,27	67	22,48
Superior 1st and 2nd cycles	66	10,36	37	12,42
Superior 3rd cycles	2	0,31	10	3,36
Existence of medical coverage				
Yes	511	80,22	231	77,52
No	126	19,78	67	22,48

3.3 Medical Information of the women included in this Study

Women with normal body weight were secondary in 50.55%. They had a height of [1.60, 1.70 m [in 52.59%, and an average weight of 77.095± 4.450, with women weighing between [60 kg, 80 kg [in 49.45%. They had a full-term delivery in 70.17% and an over term delivery in 25.27%. Their delivery was uncomplicated in 95.76%. They had a vaginal delivery in 99.22%. They had a birth without an episiotomy in 63.58%. The average number of days of hospitalization for this group was 1.88± 0.36, with 2 days of hospitalization in 85.87%. These women had eutrophic newborns in 86.66%, and male newborns in 50.39%. Overweight women were primiparous in 61.41%. They are between [1.60, 1.70 m [in 47.65%, and an average weight of 87.929± 4.850, with 81.88% of women weighting [80 kg, 90 kg]. They had an over term birth in 70.80% and a full-term pregnancy in 22.82%. They had a eutocic

delivery in 74.50%. They had a vaginal delivery in 72.82%. They had an episiotomy birth in 63.76%. The average number of days of hospitalization for these women was 1.85± 0.37, with a 2-day hospitalization in 83.89%. The second group had a eutrophic newborn in 86.24% of the cases, and 52.68% of birth were male. (**Table 2)**

Table No. 2: Medical Information of the women included in this Study

	Surveyed cases N= 935			
	Normal corpulence n= 637		**Normal corpulence n= 637**	
Variables	**Effective**	**Percentage (%)**	**Effective**	**Percentage (%)**
Parity				
Primipare	284	44,58	183	61,41
2nd P	322	50,55	85	28,52
3rd P	24	3,77	19	6,38
⩾4 P	7	1,10	11	3,69
Size				
< 1m50	02	0,31	00	00
[1m50, 1m60 [	214	33,59	139	46,64
[1m60, 1m70 [	335	52,59	142	47,65
[1m70, 1m80]	86	13,5	17	5,70
Weight (mean± SD)	77,095± 4,450		87,929± 4,850	
< 60kg	04	0,63	00	00
[60kg, 80kg [	315	49,45	12	4,03
[80 kg, 90 kg]	318	49,92	244	81,88
>90 kg	00	00	42	14,09
Pregnancy term				
Premature delivery	29	4,55	19	6,38
Term delivery	447	70,17	68	22,82
Term overrun	161	25,27	211	70,80
Childbirth process				
Uncomplicated	610	95,76	222	74,50
With complication	27	4,24	76	25,50
Mode of delivery				
vaginal delivery	632	99,22	217	72,82
Cesarean	05	0,78	81	27,18
Episiotomy practice				
Yes	232	36,42	190	63,76
No	405	63,58	108	36,24
Number of days in hospital (mean± SD)	1,88± 0,36		1,85± 0,37	
1 day	84	13,19	46	15,44
2 days	547	85,87	250	83,89
3 days	6	0,94	2	0,76
Weight of newborns				

Hypotrophic	72	11,30	28	9,40
Eutrophic	552	86,66	257	86,24
hypertrophic	13	2,04	13	4,36
Sex of newborns				
Female	316	49,61	141	47,32
Male	321	50,39	157	52 ,68

3.4 Body Mass Index of women surveyed

The percentage of women who had a Body Mass Index between [18.5 kg to 25 kg] was 68.13%, with a mean ± SD of 22.808± 1.315. Whereas, 31.87% of women who have given birth had a BMI between [25Kg to 30Kg], with a mean ± SD of 26.388± 1.032. (**Table 3**)

Table No. 3: Body Mass Index of women Surveyed

	Surveyed cases N= 935		
BMI	**Effective**	**Percentage (%)**	**Mean± SD**
[18,5Kg à 25Kg]	637	68,13	22,808± 1,315
]25Kg à 30Kg]	298	31,87	26, 388± 1,032

3.5 Post-natal complications diagnosed among the surveyed women

Between hospital output and 9th day of postpartum, this cohort had breast engorgement in 13.80%, urinary tract infection in 11.34%, early genital hemorrhage in 8.56%, breast lymphangitis in 5.78%, endometritis in 5.56%, baby blues in 1.18% and pelvic peritonitis in 0.21%. While they had between the 9th and 42nd days of postpartum, Return of hemorrhagic layers in 11.02%, postpartum depression in 9.20%, urinary tract infection in 5.45%, breast engorgement in 3.42%, breast lymphangitis in 1.71%, postpartum psychosis in 1.39% and acute mastitis in 0.32%. (**Table 4)**

Table No. 4: Post-natal complications diagnosed among the surveyed women

	Surveyed cases N= 935	
Diagnosed post-natal complications	**Effective**	**Percentage (%)**
Between hospital output and the 9th day of post-partum		
Early genital hemorrhage	80	8,56
Endometritis	52	5,56
Pelviperitonitis	02	0 ,21
Urinary tract infection	106	11,34
Breast engorgement	129	13,80
Mammary Lymphangitis	54	5,78
Baby-blues	11	1,18
Between day the 9th and 42nd days of post-partum		
Return of hemorrhagic layers	103	11,02
Urinary tract infection	51	5,45
Breast engorgement	32	3,42
Mammary Lymphangitis	16	1,71
Acute mastitis	03	0,32
Postpartum depression	86	9,20
Postpartum psychosis	13	1,39

3.6 Comparison of socio-demographic characteristics of the study cohort

Comparison of the socio-demographic characteristics of our cohort showed that the average age of women with normal corpulence was 23,982± 4,314, of which 53.69% were aged between [30 and 40 years]. The average age of overweight women was 26.802± 5.015, of which 64.09% were aged between [20, 30 years]. The urban origin was 61.54% within the normal corpulence group and 50.67% within the overweight group. The study level of the first group was collegial in 34.07%, while the study level of the second group was primary in 29.53%. 80.22% of the women in the first group had medical coverage, compared to 77.52% of the births in the second group. (**Table 5**)

Table No. 5: Comparison of socio-demographic characteristics of the study cohort

	Surveyed cases N= 935				
	Normal corpulence n= 637		**Normal corpulence n= 637**		**P**
Variables	**Effective**	**Percentage (%)**	**Effective**	**Percentage (%)**	
Age range (mean± SD)	23,982± 4,314		26,802± 5,015		
< 20 years old	87	13,66	13	4,36	
[20s, 30 years old [	203	31,87	191	64,09	<0,001
[30, 40 years old]	342	53,69	89	29,87	
>40 years old	5	0,78	5	1,68	
Provenance					
Urban	392	61,54	151	50,67	
Rural	209	32,81	117	39,26	0,001
Suburban	36	5,65	30	10,07	
Study level of the woman who have given birth					
Illiterate	12	1,88	10	3,36	
M'Cid or Koranic school	00	00	00	00	
Primary	179	28,10	88	29,53	
College	217	34,07	86	28,86	0,617
High school	161	25,27	67	22,48	
Superior 1st and 2nd cycles	66	10,36	37	12,42	
Superior 3rd cycles	2	0,31	10	3,36	
Existence of medical coverage					
Yes	511	80,22	231	77,52	0,342
No	126	19,78	67	22,48	

3.7 Comparison of medical characteristics of the study cohort

The comparison of the medical characteristics of our cohort showed that 50.55% of deliveries with normal body weight were secondary., whereas, overweight women were primiparous in 61.41%. 70.17% of the first group had a full-term delivery, and 70.80% of the second group had an over term delivery. Women with uncomplicated deliveries accounted for 95.76% of the first group and 74.50% of the second group. 99.22% of the first group and 72.82% of the second group gave birth through vaginal delivery. 63.58% of the women with normal body weight gave birth without an episiotomy. At the same time, 63.76% of overweight women gave birth with episiotomy. The average number of hospital days was almost identical for both groups. It was 1.88± 0.36 for the first group and 1.85± 0.37 for the second group.

Newborns were eutrophic in 86.66% of deliveries in the first group and 86.24% of deliveries in the second group. (**Table 6**)

Table No. 6: Comparison of medical characteristics of the study cohort

	Surveyed cases N= 935				
	Normal corpulence n= 637		**Normal corpulence n= 637**		**p**
Variables	**Effective**	**Percentage (%)**	**Effective**	**Percentage (%)**	
Parity					
Primipare	284	44,58	183	61,41	
2nd P	322	50,55	85	28,52	
3rd P	24	3,77	19	6,38	<0,001
⩾4 P	7	1,10	11	3,69	
Pregnancy term					
Premature delivery	29	4,55	19	6,38	0,033
Term delivery	447	70,17	68	22,82	
Term overrun	161	25,27	211	70,80	
Childbirth process					
Uncomplicated	610	95,76	222	74,50	0,031
With complication	27	4,24	76	25,50	
Mode of delivery					
vaginal delivery	632	99,22	217	72,82	
Cesarean	05	0,78	81	27,18	0,005
Episiotomy practice					
Yes	232	36,42	190	63,76	<0,001
No	405	63,58	108	36,24	
Number of days in hospital (mean± SD)	1,88± 0,36		1,85± 0,37		
1 day	84	13,19	46	15,44	
2 days	547	85,87	250	83,89	0,023
3 days	6	0,94	2	0,76	
Weight of newborns					
Hypotrophic	72	11,30	28	9,40	
Eutrophic	552	86,66	257	86,24	0,102
hypertrophic	13	2,04	13	4,36	
Sex of newborns					
Female	316	49,61	141	47,32	
Male	321	50,39	157	52 ,68	0,514

3.8 Comparison of the presence of post-natal complications recorded in this study between normal corpulence vs. overweight women

The comparison of the presence of post-natal complications recorded in this study between normal corpulence and overweight women showed that between hospital output and 9th day of postpartum, pelvic peritonitis and breast engorgement were significantly associated with overweight, with successive P-values of 0.039 and 0.001. Also, This comparison revealed that among the complications recorded between the 9th and 42nd days of postpartum, mammary lymphangitis and postpartum depression are significantly associated with overweight, with a P-value of 0.035 for the first pathology and 0.011 for the second pathology. (**Table7**)

Table No. 7: Comparison of the presence of post-natal complications recorded in this study between normal corpulence vs. overweight women

	Surveyed cases N= 935				
	Normal corpulence n= 637		**Normal corpulence n= 637**		**P**
Diagnosed post-natal complications	**Effective**	**Percentage (%)**	**Effective**	**Percentage (%)**	
Between hospital output and the 9th day of post-partum					
Early genital hemorrhage	22	7,4	58	9 ,1	**0,380**
Endometritis	12	4	40	5,6	**0,161**
Pelviperitonitis	2	0,7	00	00	**0,039**
Urinary tract infection	41	13,8	65	11,3	**0,110**
Breast engorgement	57	19,1	72	11,3	**0,001**
Mammary lymphangitis	17	5,7	37	5,8	**0,949**
Baby-blues	4	1,3	7	1,1	**0,748**
Between day the 9th and 42nd days of post-partum					
Return of hemorrhagic layers	37	12,40	66	10,4	**0,350**
Urinary tract infection	22	7,4	29	4,6	**0,076**
Breast engorgement	13	4,4	19	3	**0,280**
Mammary lymphangitis	9	3	7	1,1	**0,035**
Acute mastitis	0	00	3	0,5	**0,235**
Postpartum depression	17	5,7	69	10,8	**0,011**
Postpartum psychosis	1	0,3	12	1,9	**0,06**

3.9 Existing associations between diagnosed complications and the Overweight

This analysis illustrated that between hospital output and 9th of postpartum, there was an association between the breast engorgement [RR=1.478, 95% CI [1.183-1.185], 0.001] and overweight. Also, she showed that between the 9th and 42nd days of postpartum, there are dependencies between the occurrence of the following complications and overweight: breast lymphangitis [RR=1.789, 95% CI [1.149-2.784], 0.035], and postpartum depression [RR=0.597, 95% CI [0.386-0.924], 0.011]. (**Table 8**)

Table No. 8. Existing associations between diagnosed complications and the Overweight

Diagnosed Complications	RR	IC (95%)	PX²
Between hospital output and the 9th day of post-partum			
Breast engorgement	1,478	[1,183-1,185]	**0,001**
Between day the 9th and 42nd days of post-partum			
Mammary lymphangitis	1,789	[1,149-2,784]	**0,035**
Postpartum depression	0,597	[0,386-0,924]	**0,011**

DISCUSSION

Through the analysis of existing associations between overweight and post-natal complications recorded among the surveyed women, this study showed that there is no association between post-partum hemorrhagic complications and overweight. The association between overweight and early genital hemorrhage was expressed with a non-significant P-value of 0.380. Also, the association between the return of hemorrhagic layers and overweight emerged with a non-significant P-value of 0.350, contradicting the literature that has attested to the existence of an association between postpartum hemorrhagic complications and overweight. In particular, the Sébire et al. study [13], and the Karlsson et al. study [14].

Except for pelvic peritonitis, there was no significant difference in the other infectious complications of post-natal care. This contrasts with research that has reported an association between these complications and an increase in the Body Mass Index above normal, including the Heslehurst et al. study [15], and the Le Tinier et al. study [16].

Since no cases of pelvic peritonitis were recorded in the control group, verification of the significance of the association found between pelvic peritonitis and overweight (P=0.039) was not possible. However, the P-value of this association confirms the results of several

studies that have illustrated the existence of an association between an increase in the Body Mass Index and infectious complications of the abdominal wall following childbirth. In this case, the Raynal et al. study [17], the Vermillon et al. study [18], and the Wall et al. study [19].

This study also showed that during the first 9 days of postpartum, the risk of breast engorgement is greater among overweight women. An overweight woman is 1.478 times more likely to have breast engorgement than a woman with normal corpulence [PX^2 = 0.001; 95% CI [1,183-1,185]], contradicting Peyrat's study [20] which found that there is no association between breast engorgement as a postpartum complication and an increase in Body Mass Index above normal. Whereas, Amir's study found that breastfeeding problems are more common among women with a BMI above normal [21].

Between the 9^{th} and 42^{nd} days of postpartum, the risk of having breast lymphangitis is greater among overweight women than among women with normal body weight. An overweight woman has a 1.789 times higher risk of breast lymphangitis than a woman with normal body weight [PX^2 = 0.035; 95% CI [1.149-2.784]]. Affirming the results of the Merz et al. study [22] which found that a higher than normal BMI is a risk factor for lymphangitis.

If breast engorgement and lymphangitis are associated with overweight, acute mastitis or breast abscess are not, with a non-significant P-value of 0.235. This contradicts the Rizzo et al. study [23] and the Gollapalli et al. study [24].

Baby-blues and postpartum psychosis are not associated with being overweight. The P-values of these associations are insignificant. They are 0.748 and 0.06 respectively. Also, the cross-tabulation showed that overweight is a protective factor for postpartum depression. The risk of this postpartum complication is lower in overweight births than in normal-bodied births. In fact, according to this table, an overweight woman has a 40% risk of postpartum depression compared to a woman with a normal BMI. In the literature, some studies have shown that obese women are more prone to postpartum depression. Notably the La Coursiere et al. study [25].

CONCLUSION

This study showed significant associations between the Overweight and certain post-natal complications diagnosed among the women included in the survey. This attests to the need to

take into consideration the calculation and analysis of the Body Mass Index when caring for pregnant women in the different health facilities, with the ultimate goal of participating in the reduction of maternal morbidity and mortality in Morocco.

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CONFLICTS OF INTEREST

None.

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