



# Traversing mental health disorders during pregnancy: Lebanese women's experiences of antepartum depression and anxiety

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## Abstract

**Introduction** Over the past few years, Lebanon—a developing country—has faced a plethora of economic and political challenges, with more than half of the general population presenting depressive and anxiety symptoms. However, when it comes to maternal mental health during pregnancy, the last examination in Lebanon dates far back to 2005. Our study's aim was to help delineate the factors associated with Lebanese women's mental health disorders during pregnancy, namely antepartum depression and anxiety.

**Methods** We launched a cross-sectional study among Lebanese pregnant women (age  $\geq 18$  years) between June and July 2021, during the COVID-19 lockdown ( $N = 433$ ).

**Results** In total, 87.8% of the participants experienced depression (mild to severe), where severe depression was observed in 7.9%. In addition, 70.3% had a significant level of anxiety. Increased pregnancy-specific hassles ( $\beta = 0.93$ ), being Muslim compared to Christians ( $\beta = 3.19$ ), being afraid of an existing aggressor ( $\beta = 8.75$ ), urinary tract infections ( $\beta = 2.02$ ), and higher gestational age ( $\beta = 0.07$ ) were significantly associated with higher depression, whereas higher physical activity index ( $\beta = -0.09$ ) and increased disordered eating attitudes during pregnancy ( $\beta = -0.27$ ) were significantly associated with less depression, all accounting for 60.4% of the model's variance. Additionally, increased pregnancy-specific hassles ( $\beta = 0.54$ ), being Muslim compared to Christians ( $\beta = 2.42$ ), urinary tract infections ( $\beta = 1.72$ ), and having been emotionally or physically abused ( $\beta = 1.19$ ) were significantly associated with higher levels of anxiety and could predict 49% of the total variance.

**Conclusion** Our study has suggested the existence of factors that have additive effects in potentiating the risk for depression and anxiety among Lebanese pregnant women, namely cultural beliefs, pregnancy-related distress, medical complications during pregnancy, and a history of abuse. Therefore, it would be judicious to implement screening programs targeting pregnant women at risk for antepartum depression and anxiety. In addition, high rates of prenatal depression and anxiety were detected among our sample, supporting that recognizing and treating maternal mental health disorders should be prioritized during antenatal care in Lebanon.

**Keywords** Abuse · Antenatal depression · Antenatal anxiety · Disordered eating attitudes · Pregnancy · Psychological distress

## Introduction

Nonpsychotic mental disorders are among the most frequently encountered morbidities during pregnancy and postpartum, both known as the perinatal period [1]. However,

existing literature tackling perinatal mental health disorders has thus far conferred most of the attention to depressive disorders, specifically postpartum depression, severely overlooking other substantial morbidities [1]. Actually, although somatic symptoms, such as severe fatigue, fidgety,

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and sleep disturbances, may be commonly found in pregnancy, they remain valid indicators of antepartum depression and should not be immutably considered normative pregnancy experiences [2, 3]. Indeed, depressive disorders are particularly prevailing during pregnancy. A systematic review estimated that the point prevalence of minor and major depression during pregnancy ranges between 8.5 and 11% in developed countries, while the point prevalence of major depression alone varies between 3.1 and 4.9%. Nonetheless, owing to the wideness in the depicted confidence intervals, it was arduous to pinpoint the accurate levels of those prevalence estimates, leaving them ambiguous [4]. Furthermore, another recent systematic review, performed in 2019, calculated a prevalence rate of 16.4% for antenatal depression after omitting confounding variables [5]. Alongside antepartum depression, anxiety disorders during pregnancy are usually left unnoticed despite their high prevalence ( $\approx$  13–15%) in both developing and developed nations [1, 6, 7]. In point of fact, depressive and anxiety disorders are strongly interrelated; for instance, Wisner et al. have detected the presence of comorbid anxiety disorders among almost two-thirds of women who screened positive for depression in the perinatal period [8].

The risks for mental health disorders during pregnancy appear to be strongly dependent on sociocultural factors, most of them being beyond individuals' control. A systematic review concluded that nonpsychotic common perinatal disorders are most pervasive among women who derive from disadvantaged social/economic backgrounds (i.e., low and lower-middle-income countries, rural areas, crowded households, etc.) [9]. However, several studies have identified other risk factors for such disorders that relate to the interacting environment of the mother-to-be. To exemplify, violence against women, represented by both emotional and physical abuse, is one of the factors that has detrimental effects on maternal mental health during the perinatal period, particularly in cases where women are more dependent [9]. Accordingly, a poor/abusive partner relationship, the lack of partner encouragement during pregnancy, and defective social support systems have also been numerously incriminated in deteriorating women's mental health, whereas supportive family relationships appeared to be a protective element [9–12].

Furthermore, although pregnancy is often thought to be a marvelous period of time for the majority of women, some of them might go through various pregnancy-related concerns and negative emotions, hence experiencing depression and anxiety symptoms [13]. In reality, researchers have long perpetuated the description of pregnancy as a "potent stressor" and "psychological burden," owing primarily to its highly fluctuating emotional states [14]. As a consequence, capturing the integral experience of women during

pregnancy has always been challenging [15, 16]: the exclusive focus on depression and anxiety when delineating the components of gestational psychological distress has overshadowed many stressors intricately related to pregnancy, which are not completely assessed by the general instruments for distress, hence resulting in a failure to exactly portray the extent of the pregnant torments [16]. For this sake, DiPietro et al. outlined a novel measurement method, addressing maternal appraisal of daily experiences specific to pregnancy (e.g., pain, incontinence, spotting, heartburn, sleep quality, physical abilities, physical intimacy, concerns about labor/delivery, weight gain, etc.) [17]. Thereafter, it was observed that those pregnancy-specific hassles are intricately related to both depressive and anxiety symptoms in pregnancy [16].

Consistently, attitudes about weight gain during pregnancy are at the core level of women's psychological functioning [18]. For instance, Roomruangwong et al. found that body image dissatisfaction had positive associations with antepartum depression, the severity of depression, and trait anxiety [19]. Likewise, in 2020, Chan et al. demonstrated that body dissatisfaction before/during pregnancy was positively correlated with prenatal depressive and anxiety symptoms in a large cohort of 1371 Chinese pregnant women [20]. Furthermore, when it comes to disordered eating behaviors during pregnancy, there is strong evidence that proposes relationships with both antepartum depression and anxiety [21, 22]. Nonetheless, directional associations could not be firmly established within the existing literature [21].

Over the past few years, Lebanon—a developing country—has faced a plethora of economic and political challenges; the radical changes that have occurred in Lebanese people's daily life (e.g., deteriorations in health and education sectors, work habits, and daily lifestyles) were doubtlessly detrimental to their mental well-being. According to recent Lebanese studies, the deteriorating economic situation has even resulted in food insecurity among the Lebanese population [23, 24]. Remarkably, depressive symptoms have been detected among more than half of Lebanese adults (59.7%) [25]; likewise, anxiety has been identified among no less than 49.9% [26]. Previous investigations in Lebanon have also spotlighted high prevalence rates of abusive behaviors against women, with 37.1 and 49.4% of women having been exposed to physical and non-physical abuse, respectively [27]. Another recent study has noticed a growing emergence of physical/psychological violence against women through the COVID-19 quarantine as compared to baseline levels before the pandemic [28]. Moreover, most recently on August 4, 2020, the latest ammonium nitrate blast that occurred in the Port of Beirut was classified as the third most disastrous urban explosion in human history after the atomic bombings at the end of World War II [29].

This large blast took the description of a human tragedy, engendering more than 200 deaths, several thousands of instant injuries, and hundreds of thousands of people who became completely homeless [30, 31]. This incident has left deleterious psychological impacts deep into every Lebanese resident's consciousness.

However, when it comes to maternal mental health during pregnancy, the last examination in Lebanon dates far back to 2005, which had exclusively focused on depressive symptoms among a sample of 79 Lebanese women recruited from the gynecology outpatient department of a tertiary referral hospital in Beirut [32]. Depression was identified among 13.9% of the participants. The principal risk factors for depression were financial difficulties, poor partner support/relationship, an unwanted pregnancy, the occurrence of medical complications (e.g., cramps, bleeding, risk of premature birth, diabetes, etc.), the presence of mood disorders around menstruation, a personal/familial history of depression, and a personal history of anti-depressive medication and/or oral contraceptive use [32]. Nevertheless, to the best of our knowledge, to date, no Lebanese study has delved into the prevalence and correlates of prenatal anxiety. Additionally, based on an appraisal of the most recent literature, a broader set of predictors appears to be rational and worthwhile when exploring mental health issues during pregnancy.

Undeniably, looking into the factors that may be connected to an increased propensity for prenatal depression and anxiety is of crucial interest, owing to the fact that mental disorders during pregnancy may impact maternal/infant health adversely, by generating substantial mortality rates and serious morbidities (e.g., increased risk of addictions in pregnancy, obstetrical complications, preterm birth, compromised postpartum bonding, psychological and neurodevelopmental disturbances in children, as well as malnutrition, growth impairment, and infectious/diarrheal diseases; as infants are highly dependent on their mothers for physical care and social interaction) [9, 33–39]. A thorough comprehension of the underlying risk factors may enlighten the path towards further refining the identification of maternal mental disorders and enhancing prevention programs in Lebanon. Therefore, our study's aim was to help delineate the factors associated with mental health disorders during pregnancy, namely antepartum depression and anxiety, among the Lebanese population. We hypothesized that pregnancy-related distress, body dissatisfaction, disordered eating attitudes, as well as a history of abuse (emotional, physical, or sexual) would intensify depressive and anxiety symptoms, whereas adequate social support would be protective against antepartum depression and anxiety. We also predicted that the presence of medical conditions/complications during pregnancy would heighten depression and anxiety among Lebanese pregnant women.

## Methods

### Study design

We launched a cross-sectional study among Lebanese pregnant women (age  $\geq 18$  years old) during June and July 2021. The data collection was carried out using the snowball sampling method to respect the governmental directives through the COVID-19 pandemic (i.e., the abstinence from conducting face-to-face interviews during the lockdown). The questionnaire was created on Google Forms and consisted of standardized measures. Thereupon, the Google form link was distributed using social media networks, namely Facebook and WhatsApp, in order to reach participants residing in the five Lebanese districts (i.e., Beirut, Mount Lebanon, North, South, and Bekaa). Women were also asked to share the link with their gravid peers when completing the questionnaire. The confidential self-administered character of the survey contributed to the avoidance of social influences by respecting the privacy of the participants and promoting the integrity of their answers.

### Minimal sample size calculation

A minimal sample size of 395 gravid women, calculated using the G\*power 3.1.9.7 software (linear multiple regression: fixed model,  $R^2$  increase) [40], was a must to achieve significant correlations between the variables of interest (depression/anxiety) and their potential correlates. This computation considered several statistical parameters: an effect size  $f^2 = 2\%$  (small effect, according to Cohen's classification [41]), a type I error = 5%, a statistical power = 80%, and inclusion of  $N = 23$  predictors in the analysis. The final sample included 433 participants.

### Translation procedure

The Arabic version of the Patient Health Questionnaire (PHQ-9) [42] and the Lebanese Anxiety Scale (LAS-10) [43] were used in the current research to appraise depression and anxiety among pregnant women, respectively. Both scales detain valid constructs and have shown their reliability among the Lebanese population. The remaining self-report measures were forward–backward translated (from English to Arabic and vice versa) by two linguistically competent healthcare providers, as per the international guidelines for cultural adaptation of self-reported scales and clinical assessment tools [44, 45]. The initial English version of each scale and its back-translated version were scrutinized for disparities by a committee of experts, and the final Arabic versions were approved since no discrepancies were detected [46].

## Questionnaire and variables

We first performed a sociodemographic assessment of the participants; we asked about the following characteristics: age, educational level, religion, marital status, and the Lebanese district of residence. In addition, the socioeconomic status was appraised by the household crowding index, which measures the ratio: number of people residing in the same house/number of rooms in the house (without counting the bathrooms and kitchen). An increase in this ratio indicates a deterioration of the economic situation [47]. To evaluate the extent of exercising during the current pregnancy, we used the physical activity index: a function of the frequency, duration, and intensity of exercise [48]. The body mass index during pregnancy was computed according to the formula: weight (kg)/height<sup>2</sup> (m) [49]. Obstetrical characteristics, such as gestational age (current week of pregnancy) and gravidity, were collected as well. Additionally, women were questioned about the presence of medical conditions during the present gestation, namely chronic diseases such as heart or pulmonary diseases, hypertension (preexisting or gestational), diabetes (preexisting or gestational), urinary tract infections, and risk of bleeding or miscarriage or premature delivery. Based on previous research showing that an unintended/unwelcomed pregnancy was associated with heightened risks of mental health problems [50], women were also asked whether the current pregnancy was desired (the answer was categorized into yes or no). The total estimated time of the questionnaire was 15 min. It also included the following tools:

**The patient health questionnaire (PHQ-9)** The PHQ-9 is a succinct 9-item scale, whose primary objective at the time of its development was to pinpoint the severity of depression among patients in order to improve therapeutic directions. Items are selected from the nine DSM-IV criteria for depression, and each item is scored according to the frequency of symptoms (varying from 0 = “not at all” to 3 = “nearly every day”). The assessed symptoms include “Trouble falling or staying asleep, or sleeping too much,” “Feeling tired or having little energy,” and “Little interest or pleasure in doing things”. Total scores vary between 0 and 27, and the severity of depressive symptoms is categorized into mild (scores of 5–9), moderate (scores of 10–14), moderately severe (scores of 15–19), and severe depression (scores of 20–27). In the original validation, the PHQ-9 was successfully tested among gynecology/obstetrics samples [51]. The Arabic version has previously been proved to be valid and performant in detecting depression among Lebanese adults [42]. In this study,  $\alpha$ Cronbach = 0.846.

**The Lebanese anxiety scale (LAS-10)** It is a 10-item instrument built on a pool of diagnostic criteria that were selected

from the DSM-5, HAM-A, and STAI scales. To rule out anxiety, the optimal cutoff point was found to be a score  $\geq 13.5$ , with good sensitivity/specificity and a high area under the curve. Items include “I have somatic (muscular) problems (pains and aches, twitching, stiffness, myoclonic jerks, grinding of teeth, unsteady voice, increased muscular tone)” and “I have tension (feelings of tension, fatigability, startle response, moved to tears easily, trembling, feelings of restlessness, inability to relax)”. A positive screen of anxiety encourages the referral to a physician for deeper evaluation [43]. This scale was originally constructed in Arabic and validated among Lebanese individuals. In our study,  $\alpha$ Cronbach = 0.897.

**The abuse assessment screen (AAS-5)** In 1998, Soeken et al. generated this instrument, which is reliable to screen for emotional, physical, and sexual abuse against women. It includes five questions of a yes/no type. Additionally, in case of a positive history of abusive behaviors, the respondent is prompted to report the aggressor’s identity and the frequency and severity of assaults; the latter is scored as 1 = “threat of abuse” to 6 = “wound from weapon” [52].

**The arabic version of the disordered eating attitudes in pregnancy scale (A-DEAPS)** The A-DEAPS is a 10-item nominal measure that evaluates the extent of disordered eating attitudes experienced during pregnancy. Validated among Lebanese pregnant women, it focuses on “pregorexia”-type dysfunctional eating/restrained eating in pregnancy (i.e., pathological weight worry and restrictive dietary behaviors; for instance, “I have spent considerable time researching the most effective ways to minimize how much weight I gain while pregnant”) [53]. The original instrument was developed by Bannatyne et al. in order to screen for pregnancy-specific symptoms of disordered eating [54]. In this study,  $\alpha$ Cronbach = 0.805 in the total sample.

**The pregnancy experience scale—brief form (PES-Brief)** Derived from the original PES scale [17], the PES-Brief is a 20-item instrument aiming at appraising maternal emotional and mental states during pregnancy. Items are divided equally into two sequences—the PES-Uplifts and PES-Hassles subscales. The PES-Uplifts incarnates the foremost positive stressors related to pregnancy (e.g., “Spiritual feelings about being pregnant”, “Visits to obstetrician/midwife” and “Thinking about the baby’s appearance”), whereas the PES-Hassles presents the most prominent negative stressors (e.g., “Body changes due to pregnancy”, “Thinking about your labor and delivery” and “Ability to do physical tasks/chores”). Women are asked to report how much the presented uplifts have made them feel “happy, positive, or uplifted” and how much the presented hassles have made them feel “unhappy, negative, or upset”. The score of each

item ranges from 0 (“not at all”) to 3 (“a great deal”). Both higher PES-Hassles and lower PES-Uplifts scores indicate greater maternal distress in response to pregnancy-specific emotional stimuli [16]. In this study, the internal consistency appeared to be very good for both the PES-Uplifts ( $\alpha$ Cronbach = 0.868) and PES-Hassles ( $\alpha$ Cronbach = 0.809).

**The multidimensional scale of perceived social support (MSPSS)** It is a 12-item tool measuring the intensity of perceived social support whose principal actors are friends, family and a “significant other.” Each statement (e.g., “My friends really try to help me,” “I get the emotional help and support I need from my family,” and “There is a special person who is around when I am in need”) is rated from (1): “strongly disagree” to (7): “strongly agree,” and higher total scores are representative of a stronger social support system [55]. This scale has been validated in Lebanon [56]. In this study,  $\alpha$ Cronbach = 0.956.

**The body dissatisfaction scale of the eating disorder inventory (BD-EDI)** The BD-EDI is a 9-item Likert scale. Items include “I think my thighs are too large” and, “I think my hips are too big.” Total scores may range from 0 to a maximum of 27. The greater the scores, the higher the amplitude of body dissatisfaction [57].  $\alpha$ Cronbach was 0.808 in this study.

## Data analysis

SPSS software version 25 (IBM, Armonk, NY, USA) supported the analysis and interpretation of the generated dataset. Weighting to the general population was done for the education level. Both the depression and anxiety scores had a normal distribution, as the skewness and kurtosis values ranged from  $-1$  to  $+1$  [58], and the sample size is larger than 300 [59]. To check for linear associations between continuous variables and to compare two means, Pearson correlation and the Student *t*-test were used, respectively. Bonferroni correction was done for multiple testing; the corrected *p*-value was calculated by dividing 0.05 by the number of variables entered in the analysis ( $=23$ ) = 0.002. A linear regression was conducted, taking depression and anxiety scores as dependent variables. Covariates showing a significant *p* ( $p \leq 0.002$ ) were incorporated in the linear regression. A two-sided  $p < 0.05$  was considered significant in the final model. Cronbach’s alpha values were calculated to assess each scale’s internal consistency.

## Results

Our final sample included 433 pregnant women. The characteristics and description of the total sample are shown in Table 1. In total, 87.8% of the participants had depression

(PHQ-9 scores of 5 or more), and 70.3% had anxiety (LAS-10 scores  $> 13.5$ ). Moreover, severe depression was observed in 7.9% (PHQ-9 scores of 20 or more).

## Bivariate analysis of factors associated with depression and anxiety during pregnancy

Higher physical activity index, pregnancy-specific uplifts, and perceived social support were significantly associated with lower depression, whereas higher BMI during pregnancy, anxiety, disordered eating attitudes, pregnancy-specific hassles, and body dissatisfaction were significantly associated with more depression. Furthermore, a higher gestational age (pregnancy week), more disordered eating attitudes, pregnancy-specific hassles, and body dissatisfaction were significantly associated with more anxiety, whereas more physical activity, pregnancy-specific uplifts, and perceived social support were significantly associated with less anxiety (Table 2). On another hand, a higher mean depression score was found in Muslims compared to Christians, in those with urinary tract infections, and in those with emotional/physical or sexual abuse. Moreover, a higher mean anxiety score was found in Muslims compared to Christians, in those with heart diseases, diabetes, or urinary tract infections, in those with emotional/physical, or sexual abuse, and in those with fear of an existing aggressor (Table 3).

**Table 1** Sociodemographic characteristics of the participants ( $N=433$ )

Variable	Total sample
<b>Education level</b>	
Secondary or less	62 (14.3%)
University	371 (85.7%)
<b>Religion</b>	
Christian	107 (24.7%)
Muslim	326 (75.3%)
<b>Marital status</b>	
Married	433 (100%)
<b>Depression categories</b>	
No depression	53 (12.2%)
Mild depression	148 (34.2%)
Moderate depression	135 (31.2%)
Moderately severe depression	63 (14.5%)
Severe depression	34 (7.9%)
<b>Anxiety (yes)</b>	304 (70.3%)
<b>Mean <math>\pm</math> SD</b>	
Age (in years)	28.55 $\pm$ 4.63
Household crowding index	0.82 $\pm$ 0.44
Physical activity index	12.08 $\pm$ 14.48
Pregnancy week	23.68 $\pm$ 8.68

## Multivariable analysis of factors associated with depression and anxiety during pregnancy

A first stepwise linear regression was conducted, taking depression during pregnancy as the dependent variable. Increased pregnancy-specific hassles ( $\beta = 0.93$ ), being Muslim compared to Christians ( $\beta = 3.19$ ), being afraid of an existing aggressor ( $\beta = 8.75$ ), urinary tract infections ( $\beta = 2.02$ ), and a higher gestational age ( $\beta = 0.07$ ) were significantly associated with higher depression, whereas higher physical activity index ( $\beta = -0.09$ ) and more disordered eating attitudes during pregnancy ( $\beta = -0.27$ ) were significantly associated with less depression, all accounting for 60.4% of the model's variance (Table 4, model 1).

A second stepwise linear regression, taking anxiety as the dependent variable, showed that increased pregnancy-specific hassles ( $\beta = 0.54$ ), being Muslim compared to Christians ( $\beta = 2.42$ ), urinary tract infections ( $\beta = 1.72$ ), and having been emotionally or physically abused ( $\beta = 1.19$ ) were significantly associated with higher levels of anxiety and could predict 49% of the total variance (Table 4, model 2).

## Discussion

Our study worked forwards to identify the factors that best predict antepartum depression and anxiety among Lebanese pregnant women. At first, higher gestational age was found to be associated with increased depressive symptoms. This finding is not novel since some reviews have witnessed an

elevation of antenatal depression rates as pregnancy progresses [5, 60], as women approach the stressful events of childbirth and motherhood responsibilities [61].

Unsurprisingly, the analysis showed that pregnancy-specific distress, assessed through the PES-Hassles subscale, was a substantial contributor to depressive and anxiety symptoms during pregnancy. These findings converge to the existing literature that has replicated the underlined associations in different populations and settings [16, 62]. Indeed, pregnancy is a unique period of life that overwhelms each expectant mother with experiences of psychological ambivalence, concretized by emotional disturbances, sudden transitions from exhaustion to exaltation, or even mixed anxiety and depressive disorders [14]. Moreover, pregnancy might generate certain apprehensions regarding its progress and delivery outcomes (e.g., discomfort, pain, course of labor, health status of the child at birth, etc.), hence making the pregnant woman susceptible to mental health disorders, depending on her adaptive and coping abilities [14, 63].

A further conspicuous outcome was the positive association between the presence of an abusive aggressor and maternal mental health disorders, in line with previous studies [9, 64]. A Turkish study was apt to provide evidence that experiences of both prenatal depression and anxiety are primarily influenced by emotional/conjugal problems, exposures to physical violence, and intimate partner violence [65]. Thus, it is noteworthy that abuse/violence against women pertains to prevalent troubles in many societies and should then be conferred paramount attention, particularly during prenatal care. Reinforcing law measures remains vital in a multitude of countries.

It is also worth mentioning that the intensity of depression/anxiety differed according to the religious beliefs of the participants. Previous evidence exists to support the effects of cultural influences on maternal mental health, specifically during the perinatal period. A synthesis of evidence has asserted that the risks for mental disorders are heightened by “gender-based factors,” namely in certain communities and multi-generational settings where preferences against female babies prevail, with restrictions on a daughter-in-law's autonomy when it comes to household chores and infant care [9].

In addition, participants who reported urinary tract infections during pregnancy felt more anxious and depressed in the current study, in agreement with previous studies that pointed out physical conditions/medical complications as important stress factors that may lead to psychological distress among pregnant women [32, 65]. Urinary tract infections, in particular, constitute the most frequently contracted bacterial infections during pregnancy and are associated with serious and eventual life-threatening perinatal/maternal complications, including pregnancy-induced hypertension, premature birth, fetal death, and preeclampsia [66, 67].

**Table 2** Correlation between depression/anxiety during pregnancy and continuous variables

Variable	Depression		Anxiety	
	R	P	R	P
Anxiety	0.764	< <b>0.001</b>	1	
Age	-0.072	0.136	-0.066	0.174
Pregnancy week (gestational age)	0.009	0.857	0.152	<b>0.002</b>
Household crowding index	-0.114	0.018	0.080	0.095
Physical activity index	-0.295	< <b>0.001</b>	-0.264	< <b>0.001</b>
Body mass index during pregnancy	0.168	< <b>0.001</b>	0.135	0.005
Disordered eating attitudes	0.263	< <b>0.001</b>	0.233	< <b>0.001</b>
Pregnancy-specific hassles	0.568	< <b>0.001</b>	0.595	< <b>0.001</b>
Pregnancy-specific uplifts	-0.303	< <b>0.001</b>	-0.300	< <b>0.001</b>
Perceived social support	-0.258	< <b>0.001</b>	-0.290	< <b>0.001</b>
Body dissatisfaction	0.255	< <b>0.001</b>	0.295	< <b>0.001</b>

Numbers in bold indicate significant  $p$  according to the corrected  $p$ -values ( $p \leq 0.002$ );  $r$  = Pearson correlation coefficient

**Table 3** Correlation between depression/anxiety during pregnancy and categorical variables

Variable	Depression		Anxiety	
	Mean ± SD	P	Mean ± SD	P
<b>Education level</b>		0.460		0.438
Secondary or less (N= 62)	11.15 ± 5.74		19.03 ± 8.54	
University (N= 371)	10.63 ± 5.63		18.22 ± 8.17	
<b>Religion</b>		<b>&lt; 0.001</b>		<b>&lt; 0.001</b>
Christian (N= 107)	7.17 ± 4.82		12.94 ± 6.07	
Muslim (N= 326)	11.90 ± 5.55		20.19 ± 8.37	
<b>Desire for pregnancy</b>		0.554		0.608
No (N= 83)	11.42 ± 5.97		19.34 ± 9.71	
Yes (N= 350)	10.97 ± 5.67		18.79 ± 8.21	
<b>Gravidity</b>		0.004		0.058
First pregnancy (N= 215)	11.39 ± 4.94		19.10 ± 8.37	
Second pregnancy (N= 142)	9.93 ± 6.21		17.77 ± 7.94	
Third pregnancy or more (N= 76)	12.38 ± 6.11		20.48 ± 9.44	
<b>Hypertension</b>		0.050		0.003
No (N= 410)	11.16 ± 5.86		19.18 ± 8.60	
Yes (N= 23)	9.82 ± 3.70		15.71 ± 6.32	
<b>Heart diseases</b>		0.012		<b>0.001</b>
No (N= 426)	11.14 ± 5.69		19.05 ± 8.40	
Yes (N= 7)	5.67 ± 4.87		8.43 ± 6.63	
<b>Diabetes</b>		0.011		<b>&lt; 0.001</b>
No (N= 416)	10.86 ± 5.52		18.64 ± 8.30	
Yes (N= 17)	19.58 ± 8.09		29.96 ± 9.59	
<b>Pulmonary diseases</b>		0.037		0.004
No (N= 417)	10.87 ± 5.57		18.62 ± 8.38	
Yes (N= 16)	14.70 ± 7.52		24.1 ± 8.94	
<b>Urinary tract infections</b>		<b>&lt; 0.001</b>		<b>&lt; 0.001</b>
No (N= 363)	10.40 ± 5.24		18.04 ± 7.84	
Yes (N= 70)	14.14 ± 6.82		22.87 ± 10.14	
<b>Emotional or physical abuse</b>		<b>&lt; 0.001</b>		<b>&lt; 0.001</b>
No (N= 271)	9.90 ± 5.61		17.61 ± 8.01	
Yes (N= 162)	12.88 ± 5.41		20.91 ± 8.81	
<b>Sexual abuse</b>		<b>0.001</b>		<b>&lt; 0.001</b>
No (N= 427)	10.93 ± 5.66		18.66 ± 8.30	
Yes (N= 6)	18.54 ± 4.52		33.00 ± 7.54	
<b>Fear of the aggressor</b>		0.016		<b>&lt; 0.001</b>
No (N= 427)	10.93 ± 5.67		18.64 ± 8.33	
Yes (N= 6)	14.91 ± 6.03		27.23 ± 9.51	

None of the respondents reported a risk of bleeding or miscarriage or premature delivery. All variables not showing in the table did not show a significant association. Numbers in bold indicate significant p-values

On the other hand, increased physical activity during pregnancy had an inverse association with depression scores, suggesting a potential protective role. Parallely, a previous Lebanese study reported that exercising during pregnancy had a positive impact on quality of life; moreover, reduced total physical activity was observed in pregnant women who presented depressive symptoms [68]. Consequently, given the favorable suggested outcomes, encouraging regular physical activity during pregnancy seems sagacious.

Finally, a higher score of disordered eating attitudes in pregnancy was associated with less antenatal depression in our sample, in contradiction to the available literature suggesting that disordered eating predicts poor mental health outcomes among pregnant women [21]. This result is novel since, to the best of our knowledge, no previous research has come across such negative associations. Nonetheless, when scrutinizing eating styles among depressed patients in the Netherlands, Paans et al. depicted no associations

**Table 4** Stepwise linear regressions taking depression/anxiety during pregnancy as dependent variables

Model 1: Depression as the dependent variable (Nagelkerke $R^2 = 60.4\%$ )				
Variable	Beta	B	<i>p</i>	95% CI
Pregnancy-specific hassles	0.93	0.67	< <b>0.001</b>	0.83–1.02
Religion (Muslim vs Christian*)	3.19	0.15	< <b>0.001</b>	1.81–4.57
Physical activity index	–0.09	–0.16	< <b>0.001</b>	–0.12 to –0.05
Fear of the aggressor (yes vs no*)	8.75	0.17	< <b>0.001</b>	5.65–11.85
Urinary tract infections (yes vs no*)	2.02	0.09	<b>0.004</b>	0.64–3.40
Disordered eating attitudes	–0.27	–0.09	<b>0.012</b>	–0.47 to –0.06
Gestational age (pregnancy week)	0.07	0.08	<b>0.016</b>	0.01–0.13
Model 2: Anxiety as the dependent variable (Nagelkerke $R^2 = 49\%$ )				
Pregnancy-specific hassles	0.54	0.58	< <b>0.001</b>	0.48–0.61
Religion (Muslim vs Christian*)	2.42	0.16	< <b>0.001</b>	1.37–3.47
Urinary tract infections (yes vs no*)	1.72	0.12	<b>0.001</b>	0.68–2.77
Emotional or physical abuse (yes vs no*)	1.19	0.10	<b>0.005</b>	0.36–2.01

\*Reference group; *beta*, unstandardized beta;  $\beta$ , standardized beta; *CI*, confidence interval; numbers in bold indicate significant *p*-values

between depression and restrained eating patterns [69]. In addition, despite prior consensus on the correlation between disordered eating attitudes and antenatal depression, the directional and temporal natures of these associations are somewhat ambiguous [21]. Thus, it is conceivable that mental health disorders engender eating pathologies in pregnant women, that perinatal depression is the repercussion of a history of eating disorders, or that disordered eating and depressive symptoms are linked through a cyclical/reciprocal relationship [70]. Similar to “the escape theory,” which regards binge eating as a negative coping behavior through which individuals attenuate emotional torments via an alternative focus on food [71], purging may serve as a coping instrument to reduce preoccupations and anxiety about weight gain [72]; hence, alleviating psychological distress among pregnant women who are excessively anguished by weight gain during pregnancy. Nevertheless, elucidating the direction of this correlational model is of fundamental importance in furtherance of burnishing prevention and treatment [70]. To clarify, if depression puts pregnant women at risk for disordered eating rather than vice versa, targeting prenatal depression would be sufficient to circumvent both disturbances. Therefore, future prospective investigations are warranted to test those bidirectional associations [21].

### Clinical implications

This paper has underscored high rates of prenatal depression and anxiety in Lebanon compared to the reported prevalence rates in the existing literature [1, 4]. It thus demonstrates the paramount importance of integrating maternal mental health

care into future health policies in the country. In fact, previous research has reported that the severe stigmatization of women with mental health disorders often leads to their abstinence from participating in perinatal and preventive healthcare [73]. Moreover, when compared to non-gravid women with psychiatric disorders, pregnant women have been found to be less likely to seek treatment for any psychiatric disorder [6]. Consistently, maternal mental health care remains broadly deficient in Lebanon. Therefore, laborious awareness programs and healthcare services need to be implemented in order to prevent maternal mental health disorders from being unrecognized and left untreated. On another hand, the current study has highlighted some modifiable factors associated with prenatal depression and anxiety, such as abuse and pregnancy-related distress, which could be targeted by prevention and treatment programs. Further nonmodifiable risk factors were also pointed out, including religious beliefs and medical complications in pregnancy. Thus, this study provides qualitative knowledge about the risk factors of antepartum depression and anxiety and permits the determination of at-risk groups—who must be screened and supported. Future prospective studies are needed to confirm the causal mechanisms through which the studied predictors interact with maternal mental health, as well as to identify protective factors, in order to suggest targeted interventions. For instance, prior research has indicated that pregnant women may benefit from eHealth interventions, particularly from mindfulness-based programs, as a way to reduce their risk of developing depression and anxiety [74, 75]. Such studies in Lebanon would generate prime evidence about mental health problems during pregnancy, which appears to be primordial in Lebanon, in order to act and make pregnancy safer.



## Limitations

Our findings should be considered in light of several limitations. At first, our descriptive transversal study is unable to prove causality within the underlined associations. In addition, self-report questionnaires might occasion misreports of symptoms, thus inducing an information bias, with the added consideration that the Arabic versions of some used measures are not validated in Lebanon yet. Given the impossibility of conducting face-to-face interviews during the COVID-19 pandemic, online snowball sampling became an alternative. However, when only reaching smartphone users through specific social media networks, online surveys constitute a potential source of selection bias. Therefore, the generated dataset in this study should be cautiously interpreted, and conclusions cannot be generalized to the whole target population. Moreover, it is worth mentioning that in the context of this ongoing pandemic, mental health issues are on the rise. A recent study has shown a significant correlation between the COVID-19 pandemic's burdens and depression/anxiety among Lebanese people [76]; thus, the current pandemic could have contributed to an increase in depressive/anxiety symptoms, especially that some researchers have noted an exacerbation of social stressors and health anxiety among pregnant women in response to the pandemic [12, 77–79]. An investigation of depressive symptoms among pregnant women also found a high rate of depression (40%) during the pandemic [63]. Finally, confines of mental health disorders during pregnancy have not been fully explored in the current research. Additionally, given the characteristics of the current survey (i.e., cross-sectional, online, and anonymous), no prior mental health assessment could be performed by a healthcare professional and no health records were available; it therefore remains unknown whether some of the participants had a history of diagnosed depression/anxiety disorder or medication use, which would have increased their risk for prenatal depression and anxiety. We thus encourage the conduction of controlled prospective studies with a wider range of predictors in order to minimize residual confounders.

## Conclusion

In conclusion, our study has suggested the existence of factors that have additive effects in potentiating the risk for depression and anxiety among Lebanese pregnant women, namely cultural beliefs, pregnancy-related distress, medical complications during pregnancy, and a history of abuse. Therefore, it would be judicious to implement screening programs targeting pregnant women at risk for antepartum depression and anxiety. In addition, high rates of prenatal depression and anxiety were detected among our sample, supporting that recognizing and treating maternal mental health disorders should be prioritized during antenatal care in Lebanon.

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**Author contribution** SG, SO, and SH designed the study. SG performed the data collection and entry. SH was involved in the statistical analysis and data interpretation. SG wrote the manuscript. All authors reviewed the manuscript and approved the final version.

**Availability of data and materials** All data generated or analyzed during this study are not publicly available to maintain the privacy of the individuals' identities. The dataset supporting the conclusions is available upon request to the corresponding author.

## Declarations

**Ethical approval** This study's protocol received the Psychiatric Hospital of the Cross Ethics and Research Committee's approval (HPC-014–2021). All procedures complied with the Helsinki Declaration (1964, Finland) and its later amendments in terms of ethical standards. After reading all the instructions and the study's aim, which were mentioned in the questionnaire's initial section, all the surveyed pregnant women provided an informed consent before proceeding to the next questions.

**Consent to publication** Not applicable.

**Competing interest** The authors declare no competing interests.

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