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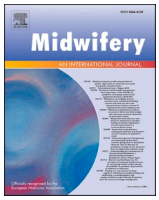

Prospective analysis of factors associated with perinatal depression

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ABSTRACT

Background: Perinatal depression is a significant public health problem that has adverse effects on both mothers and infants. Little research has been conducted on how depressive symptoms change throughout the perinatal period, especially in the Middle East. This study examines changes in depressive symptoms from pregnancy to the postnatal period, and what explains these changes.

Methods: This prospective study recruited 306 Omani women in the third trimester of pregnancy and followed them up two to eight weeks after delivery. The Edinburgh Postnatal Depression Scale (EPDS), with a cut-off of ≥12, was used to assess depressive symptoms in both the antenatal and postnatal periods. Independent t-tests, one-way ANOVA, Tukey's honestly significant difference test and Chi-square tests were used to analyse the data.

Results: The prevalence of depressive symptoms was 27.12 % (n = 83) during late pregnancy and 29.30 % (n = 81) during the postnatal period. Four groups of women were identified based on the EPDS scores: 1) antenatal depression group (8.82 %; n = 27); 2) ante- and postnatal depression group (14.38 %; n = 44); 3) postnatal depression group (12.09 %; n = 37); and 4) non-depression group (54.90 %; n = 168). Depressive symptoms were associated with low birth weight babies (d = 0.50), which confirms the negative effects of depression on perinatal health outcomes. When compared to the non-depression group, the three depressed groups had higher antenatal Perceived Stress Scale (PSS) scores (ds > 0.52), while the non-depression group had higher antenatal and postnatal Maternity Social Support Scale (MSSS) scores (ds > 0.63), and better relationships with the mother-in-law antenatally (d= 0.57).

Conclusion: The present study of this Middle Eastern cohort shows that there were distinct groups of women experiencing perinatal depressive symptoms, influenced by various psychosocial and obstetric factors, which were comparable to those identified in more regularly studied populations. However, this study also identified other novel factors, such as the quality of family relationships. There is a need for additional research into the factors associated with these groups in order to develop appropriate interventions.

Introduction

Perinatal depression is defined as the occurrence of a major depressive episode during pregnancy (antenatal depression) and up to one year following birth (postnatal depression) (Gunduz-Bruce et al., 2022; Kimmel et al., 2020; Worthen & Beurel, 2022). Untreated perinatal depression can lead to serious negative consequences, including spontaneous abortion (Bonari et al., 2004), pre-eclampsia, caesarean section (Bonari et al., 2004; Hu et al., 2015), preterm birth, low birth weight (Bonari et al., 2004; Lobel et al., 2008) and maternal substance use (Ross & Denis, 2009). Perinatal depression takes a considerable toll on maternal mental health, leading to lower rates of breastfeeding, and can disrupt maternal-infant interaction (Gelaye, et al., 2016). A poor mother-infant relationship can result in long-term effects on the child's cognitive development, socio-emotional development, physical health and interpersonal relationships (Gelaye et al., 2016; Johnson, 2013).

The timing of risk factors (whether they appear before, during, or after pregnancy) affects the risk of perinatal depression, according to longitudinal research (Oppo et al., 2009). Understanding the risk factors through time is crucial for determining how, if at all, associations change and where future efforts can be directed to reduce and manage depression (Al-abri et al., 2023; Ettman et al., 2022). Existing evidence

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indicates that different groups of women have distinct risk factors depending on the timing of the onset of their symptoms (Sidebottom et al., 2014). A study from urban Pakistan by Husain et al. (2011) divided the sample into four groups using the EPDS scores as a baseline (depressed ≥12 and non-depressed <12) as follows: antenatal depression group, ante- and postnatal depression group, postnatal depression group and non-depression group. This study assessed women throughout their third trimester of pregnancy and again three months after childbirth. Husain et al. (2011) examined the four groups by comparing the group with ante- and postnatal depression to the group with antenatal depression and comparing the postnatal depression group to the non-depression group. The study revealed that mothers who were depressed both antenatally and postnatally experienced significantly higher levels of psychological distress, disability, and stressful life events than the antenatal depression group. These factors were also higher among the postnatal depression group compared to the non-depression group. However, this study lacked data on some identified risk factors for depression during the perinatal period, such as a history of depression and the quality of family relationships (Cankorur et al., 2015; Özcan et al., 2017). Additionally, a 43 % dropout rate at follow-up in this study limits the generalisability of its findings even further. This may be attributable to the fact that the sample was collected from women attending clinics at only one private hospital, and was not population-based; furthermore, in Karachi, particularly in the low-income population, a large proportion of births still take place at home or in nearby, relatively smaller maternity homes (Husain et al., 2011). However, our study was conducted at one large public hospital and three other public health clinics that were accessible to all women. The high dropout rate in Husain's study may also be attributable to the lengthy time period between pregnancy and postnatal assessment (in this case, three months); however, the current study achieved a higher retention rate by minimising the gap between points of measurement to be between the third trimester of pregnancy and two-eight weeks after the birth.

More recently, Underwood et al. (2017) assessed participants during the third trimester of pregnancy and nine months after delivering and found that being of Asian or Pacific ethnicity and being under perceived stress were risk factors for antenatal and postnatal depressive symptoms. A pre-pregnancy diagnosis of depression was a risk factor for postnatal depression symptoms, while anxiety during and before pregnancy was only a risk factor for antenatal depressive symptoms (Underwood et al., 2017). This study focused mainly on pre-pregnancy and pregnancy factors in order to investigate the differences between groups. Furthermore, two earlier studies (Husain et al., 2011; Underwood et al., 2017) did not examine some important factors, such as the quality of family relationships, which may be particularly pertinent to the Middle Eastern context. The aim of the present research was therefore to identify a broader range of factors, including sociodemographic, pregnancy, baby-related, and obstetric factors, as well as antenatal and postnatal psychosocial factors, such as stress and marital support, which may help explain changes in perinatal depression among various groups.

In the Middle Eastern context, despite the high prevalence rates of perinatal depression (Alshikh Ahmad et al., 2021), there are currently no studies using longitudinal methods to examine the changes in depressive symptoms during the perinatal period, to the best of the authors' knowledge. Validation of sociodemographic and other risk factors, including cultural elements such as family relationships (e.g. participants' relationships with their mothers-in-law), is also required (Al Nasr et al., 2020), as factors may be influenced by cultural differences (Silva et al., 2012). The quality of family relationships plays an essential role in the development of depression in women, particularly perinatal depression in Middle Eastern countries (Cankorur et al., 2015). The context of the family varies greatly between cultures; for example, nuclear family settings are typical in Western nations, whereas extended family arrangements are more frequent in other societies, such as in the Middle East (Cankorur et al., 2015). Therefore, when a woman gets married there, she usually moves to live with her husband and his family (Cankorur et al., 2015). In this context, a woman's expected role is to support the marriage by maintaining a good relationship with her mother-in-law, and any existing conflict may be a risk for perinatal depressive symptoms (Green et al., 2006).

To address gaps in previous studies, the purpose of the study is to extend the scope of the Underwood study by looking at a wider range of variables to understand the similarities and differences between the four distinct groups of women experiencing changes in depressive symptoms from the third trimester of pregnancy until two to eight weeks post-delivery, using the EPDS scores both antenatally and postnatally. The proposed four groups were:

(1) Antenatal depression group (antenatal EPDS ≥12, postnatal EPDS <12).
(2) Ante- and postnatal depression group (antenatal EPDS ≥12, postnatal EPDS ≥12).
(3) Postnatal depression group (antenatal EPDS <12, postnatal EPDS ≥12).
(4) Non-depression group (antenatal EPDS <12, postnatal EPDS <12).

Methods

Design and study setting

This study used a prospective design to examine four different groups with depressive symptoms from the antenatal to postnatal period, specifically from the third trimester of pregnancy until between two and eight weeks after delivery, exploring factors affecting the groups during this transition period. This study was conducted among pregnant Omani women visiting antenatal clinics at the Family Medicine and Community Clinic (FAMCO) at the University Hospital and three other primary health centres (PHCs) in Muscat, which is the capital and the most populated city in Oman. The selected PHCs were chosen according to their geographical distribution around Muscat. Data were collected by the principal investigator between July 2020 and February 2021, during the morning (7:00 am to 14:00 pm) and evening (16:00 pm to 18:00 pm) shifts, so that employed pregnant women were not missed.

Sampling and study population

The number of participants required for this study was calculated using G-power software (Faul et al., 2009). The sample size calculation suggested that 268 participants would provide 80 % power in a one-way between-subject ANOVA (four groups, alpha = .05) to detect a significant difference in variables between the groups with a medium-sized effect (0.20). However, to allow for 15 % attrition, a total of 306 participants were recruited.

Inclusion and exclusion criteria

The inclusion criteria were women who: self-identified as 'Omani', were able to speak Arabic or English, were aged 18 or above, were in the third trimester of their pregnancy, were willing to participate in the study and were willing to have a follow-up between two and eight weeks after the birth (to fill in the postnatal questionnaire). The study excluded women who had a high risk of obstetric complications (such as severe hypertension, gestational diabetes, or other severe physical or mental health conditions) or were unable to speak Arabic or English. However, those who were unable to read or write but were able to speak Arabic or English were included in the study as the principal investigator assisted them in completing the study assessments.

Measurements

Two to eight weeks after delivery, postnatal questionnaires were sent online to all the women who had completed the antenatal questionnaires. Both questionnaires included items relating to sociodemographic, marital and family relationship factors, and also psychological factors, identified through recent research (Hutchens & Kearney, 2020; Yin et al., 2021). The antenatal version of the questionnaire included items about previous pregnancies and previous baby-related factors, while the postnatal questionnaire included items about childbirth experiences, obstetric risks, and the babies' health. In addition, both the antenatal and postnatal questionnaires incorporated three screening tools: the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987), the Maternity Social Support Scale (MSSS) (Webster et al., 2000) and the Perceived Stress Scale (PSS) (Cohen et al., 1983). The validated Arabic versions of the EPDS and PSS were used with permission, with minor modifications in the Arabic version of the PSS questions and answer options to ensure they were understandable and clear to Omani Arabic-speaking individuals. The MSSS English version (Webster et al., 2000) was translated into Arabic by the principal investigator and an official legal translator, after permission was obtained from the author. Back-translation was completed again by both the principal investigator and an official legal translator and the translations compared to the original version to confirm consistency.

The Edinburgh postnatal depression scale (EPDS)

The EPDS is a widely accepted international measurement method used in the antenatal and postnatal periods (Buist et al., 2002; Cox., 2017). It has 10 items, each rated on a 4-point scale (0-3), giving a total score ranging from 0–30. Items focus on how the mother is feeling, for example, depressed, anxious, experiencing sleep difficulties and/or thoughts about self-harming (Cox et al., 2014). A threshold score of 12/13 on EPDS was more likely to indicate a depressive illness of varying severity, with a sensitivity of 86 % and a specificity of 78 % (Cox et al., 1987). The EPDS has been translated into Arabic and validated among Arabic women (Ghubash et al., 1997). Ghubash et al. (1997) found that the Arabic version of the EPDS had a sensitivity of 73 % and specificity of 90 % with a cut-off score of 12, and a sensitivity of 91 % and specificity of 84 % with a cut-off score of 10. Moreover, they reported that decreasing the cut-off to 10 led to an increase in false positives. Therefore, to reduce the number of false positives, and because the EPDS scale is widely used with a cut-off score of 12 to estimate the prevalence of probable antenatal and postnatal depressive symptoms (Buist et al., 2002), the EPDS with a cut-off score of 12 was used in the current study. Participants were categorized as "probably depressed" if they had a score of $\geq$12 and as "not depressed" with a score of $<$12.

The maternity social support scale (MSSS)

The MSSS is a self-report questionnaire that includes six items on a 5-point-Likert scale, giving a total maximum score of 30 points (Webster et al., 2000). The items include social elements relating to family support, relationships with friends, assistance from husband/partner, feeling controlled by husband/partner, struggles with husband/partner and feeling unloved by husband/partner (Webster et al., 2000). The MSSS has been validated for use among Arabic women in antenatal and postnatal depression research (Mohammad, Gamble, & Creedy, 2011). A study was conducted among Jordanian women (n = 353) in their last trimester of pregnancy, using the MSSS as one of the tools, which found that the Cronbach's alpha of the MSSS was 0.90 during pregnancy and 6–8 weeks after delivery, with r = 0.89 six months after giving birth (Mohammad et al., 2011).

The perceived stress scale (PSS)

The PSS is a self-report survey used to evaluate participants' perception of stress (Cohen et al., 1983). The PSS items assess the extent to which individuals believe their lives have been unpredictable, uncontrollable and overburdened in the last month (Lee, 2012). The PSS items are generic in nature rather than focused on specific events or experiences (Lee, 2012).

Chaaya et al. (2010) conducted a study to assess the validity of the Arabic translation of the PSS-10 among 268 pregnant women and after they had given birth. Cronbach's alpha was 0.74, ranging from 0.71 to 0.75 for postnatal women and pregnant women, respectively. The authors reported that the Arabic translated version of the PSS-10 was a reliable and valid tool, and recommended its use to assess stress in Arabic communities, and among women in the perinatal period (Chaaya et al., 2010).

Procedures

Two volunteer nurses who worked with perinatal women in the selected clinical settings were trained by the principal investigator on how to complete the study. Recruitment took place on the days when the trained research nurses and the principal investigator were present in the antenatal clinics. Women visiting the clinic for their antenatal evaluation in the third trimester were requested by the attending nurse and the principal investigator to participate in the study during the waiting period or after their check-ups. Informed written consent was provided by all the participants after a full explanation of the study had been provided. Overall, 600 pregnant women were invited to participate in the study, of whom 550 responded positively and, of these, 306 met the inclusion criteria and completed the antenatal questionnaire. These 306 women were followed up again by the principal investigator two to eight weeks following the birth, and 276 mothers continued their participation in the study and completed the second (postnatal) questionnaire.

Both the antenatal and postnatal questionnaires were designed to be self-administered, with the option of assistance from the principal investigator in a face-to-face interview for those with literacy issues. Some data, such as number of gestational weeks or baby weight, were extracted from the patients' records if the participants could not remember.

Analysis

The data were analysed using the Statistical Package for the Social Sciences (SPSS), version 25 (IBM Corp., Armonk, NY, USA). Descriptive analyses were performed by determining frequencies and percentages of the categorical variables, as well as the mean and standard deviation of the continuous variables. T-tests and one-way ANOVAs were used to assess the differences in continuous variables (such as age, MSSS and PSS scores) between the groups. Comparisons in categorical data between the groups were made with the Chi-square test (X^2). Tukey's post hoc test was used for multiple comparison between groups. A *P* value of $\leq$0.05 was considered statistically significant. The effect size was measured by Cohen (1988), which reports the following intervals for d: small effect = 0.2, medium effect = 0.5 and large effect = 0.8.

Results

Sample characteristics at antenatal stage

A total of 306 pregnant Omani women participated in the first phase of study (during their third trimester of pregnancy). Table 1 shows the sociodemographic characteristics of the pregnant women. The mean age of the participants was 30.27 years (range: 18–44 years old), with a mean age at first marriage of 23.87 years (range: 14–37 years old). More

Table 1
Sociodemographic characteristics (N = 306).

Variable	Mean ± SD N (%)
Age (years)	30.27 ± 5.20
Age at first marriage	23.87 ± 3.83
Level of education	
Higher school or less	123 (40.20)
University	183 (59.80)
Omani governate	
Muscat	132 (43.10)
Outside Muscat	174 (56.90)
Family income (rials)	
<500	69 (22.55)
500-1000	172 (56.21)
>1000	65 (21.2)
Work status	
Employed	121 (39.50)
Unemployed	185 (60.50)
Health condition	
No medical problems	261 (85.30)
Medical problems	45 (14.70)
Taking any medication	
Yes	41 (13.40)
No	265 (86.60)
Gestational age in weeks	
29-34	224 (73.20)
35-37	48 (15.69)
>37	34 (11.11)
Planned pregnancy	
Yes	208 (67.97)
No	98 (32.03)

than half the participants (59.80 %) had completed a university qualification, while 40.20 % had completed high school or less. Nearly half (43.10 %) were originally born in Muscat and 56.90 % came from other Omani governorates. The majority (56.2 %) of participants had a monthly family income in the range of 500-1,000 Omani rials (£966.40 - £1,932.80), and 22.5 % had a family income of less than 500 Omani rials (£966.40). Most participants were unemployed (60.50 %), and the majority (85.30 %) had no medical problems and were not taking any medication (86.6 %). In terms of gestation period, 73.2 % of the women were between 29 and 34 gestational weeks, while 15.7 % were between 35 and 37 weeks and 11.1 % were more than 37 weeks. Most of the pregnant women (68.0 %) indicated that their pregnancies were planned.

Sample characteristics at postnatal stage

Of the 306 women who participated in the first phase of the study, 30 were lost to follow-up or had incomplete postnatal questionnaires; thus, complete data were acquired for 276 postnatal participants. The sociodemographic characteristics of the women who dropped out and those who remained in the study can be found in Table 2. Of those lost to follow-up, 23 women did not reply to the call or the online postnatal questionnaire with no specific reasons given, five women explained that they were busy with their babies and were not able to fill in the postnatal survey and two of them refused to continue as their babies had died immediately after birth. Comparing these with the women who remained in the study, there were no differences noted in the sociodemographic characteristics, as shown in Table 2, though there was a significant difference in level of education ($X^2 = 7.41$; $P = 0.006$; d = 0.32). Of the women who remained in the study, almost two-thirds of them (62.31 %) had completed a university qualification, while the majority (63.30 %) of those who dropped out after the first phase had lower levels of education.

Rates of antenatal and postnatal depressive symptoms

EPDS scores ranged from a minimum score of 0 to a maximum score

Table 2
Sociodemographic characteristics of the women who dropped out at the postnatal stage (N = 30) and who remained in the study (N=276).

Variable	Mean ± SD / N (%)		X^2/t-test	*P* value	Cohen's d
	Women who dropped out	Remaining participants			
Age (years)	30.27 ± 5.64	30.28 ± 5.16	0.01	0.99	0.00
Age at first marriage	22.97 ± 5.06	23.96 ± 3.67	1.36	0.18	0.26
Family income (rials)	1.77±0.68	2.06±0.76	1.93	0.05	0.40
Level of education					
High school or less	19 (63.30)	104 (37.68)	7.41	0.006 *	0.32
University	11 (13.80)	172 (62.31)			
Omani governate					
Muscat	17 (56.70)	115 (41.67)	2.48	0.12	0.18
Outside Muscat	13 (43.30)	161 (58.33)			
Work status					
Employed	11 (36.70)	110 (39.86)	0.12	0.73	0.04
Unemployed	19 (63.30)	166 (60.14)			
Health conditions					
No medical problems	27 (90.00)	234(84.78)	0.587	0.44	0.09
Medical problems	3 (10.00)	42(15.22)			
Taking any medication?					
Yes	4 (13.30)	37 (13.41)	0	0.99	0
No	26 (86.70)	239 (86.59)			

* Statistically significant at P ≤0.05

Chi-square test (X^2) was used to assess the association between two categorical variables

The independent samples t-test was used to assess the association between continuous variables and a binary variable.

Cohen (1988) reports the following intervals for d: small effect = 0.2, medium effect = 0.5, large effect = 0.8

of 25 (mean = 8.37, SD = 4.87) in the antenatal period. Of the total of 306 women, 27.12 % (n = 83) scored ≥12 on the EPDS, indicating probable antenatal depressive symptoms, whereas 72.88 % (n = 223) had scores of <12. In the postnatal period, the EPDS scores ranged from a minimum score of 0 to a maximum score of 23 (mean = 8.50, SD = 5.29). Of the 276 women who responded to the postnatal questionnaire, 29.30 % (n = 81) scored ≥12 on the EPDS, indicating probable postnatal depressive symptoms, whereas 70.70 % (n = 195) had a score of less than 12.

Based on an EPDS cut-off score of ≥12, there were 8.82 % of women (n = 27) who had antenatal depressive symptoms only, 14.38 % % (n = 44) who had ante-and postnatal depression symptoms, 12.09% (n = 37) who had postnatal depressive symptoms only, and 54.90 % (n = 168) who were not depressed antenatally or postnatally.

Risk factors related to changes in depressive symptoms between groups

Based on ANOVA and X^2 analysis of the participants allocated to the four groups as shown in Table 3, the findings indicated that there were significant differences between participants across the four groups depending on health status (F = 2.82; $P = 0.04$; Partial η2 = 0.03, d = 0.62), relationship with their husband antenatally (F = 4.50; $P = 0.004$; Partial η2 = 0.05, d = 0.64), relationship with their mother-in-law antenatally or postnatally, respectively (F = 5.56; $P = 0.001$; Partial η2 = 0.06, d = 0.65) (F = 4.35; $P = 0.01$; Partial η2 = 0.05, d = 0.59), birth weight of the infant (F = 2.90; $P = 0.04$; Partial η2 = 0.03, d = 0.50), total antenatal MSSS score (F = 10.01; $P = <0.001$; partial η2 = 0.10, d = 1.05), total postnatal MSSS score (F = 5.38; $P = <0.001$;

Table 3
The outcome measures of the psychosocial and sociodemographic characteristics of the participants in the current study, divided into their specific depression transition groups.

Variables within four groups	Group 1	Group 2	Group 3	Group 4	X^2 or partial eta squared (η^2)	F	*P* value	Cohen's d
Age (N)	(27)	(44)	(37)	(168)	0.006	0.51	0.67	0.22
M±SD	30.26 ±5.11	30.11 ±4.97	29.38 ±5.78	30.52 ±5.10				
Age at first marriage (N)	(27)	(44)	(37)	(168)	0.017	1.53	0.21	0.49
M±SD	22.59 ±4.34	23.86 ±3.63	24.38±4.3	24.12 ±3.39				
Omani governate N (%)	14 (51.8)	23 (52.2)	15 (40.54)	63 (37.50)	4.41		0.22	0.25
Muscat	13 (48.1)	21 (47.7)	22 (59.46)	105 (62.50)				
Outside Muscat								
Level of education N (%)	14 (51.8)	21 (47.7)	13 (35.14)	56 (33.33)	5.65		0.13	0.29
High school or less	13 (48.1)	23 (52.2)	24 (64.86)	112 (66.67)				
University								
Employment status N (%)	7 (25.93)	17 (38.6)	11 (29.73)	75 (44.64)	5.4		0.15	0.28
Employed	20 (74.0)	27 (61.3)	26 (70.27)	93 (55.36)				
Unemployed								
Family income (N)	(27)	(44)	(37)	(168)	0.01	0.64	0.59	0.21
M±SD	1.96±0.76	1.98 ±0.88	2.05±0.7	2.13±0.8				
Health status(N)	(27)	(44)	(37)	(168)	0.03	2.82	0.04*	0.62
M±SD	0.11±0.32	0.05 ±0.21	0.27±0.45	0.16±0.37				
Taking any medication	(27)	(44)	(37)	(168)	0.00	0.33	0.81	0.24
(N)	1.81±0.4	1.89 ±0.32	1.89±0.31	1.86±0.34				
M±SD								
Planning pregnancy N (%)	15 (55.5)	29 (65.9)	27 (72.97)	118 (70.24)	2.81		0.42	0.2
Yes	12 (44.4)	15 (34.0)	10 (27.03)	50 (29.76)				
No								
Experiencing any mental or psychological illnesses earlier in life (N)	(27)	(44)	(37)	(168)	0.02	2.21	0.09	0.67
M ±SD	1.92±0.27	2.02 ±0.26	2.08±0.36	2.01±0.19				
Family with any mental or psychological illnesses (N)	(27)	(44)	(37)	(168)	0.01	1.28	0.28	0.35
M ±SD	2.15±0.6	2.2±0.59	2.2±0.63	2.12±0.56				
Relationship with husband's family antenatally (N)	(27)	(44)	(37)	(168)	0.05	4.50	0.004*	0.64
M ±SD	4.33 ±0.92	4.45 ±0.63	4.65 ±0.54	4.71 ±0.53				
Relationship with husband's family postnatally (N)	(27)	(44)	(37)	(168)	0.03	2.28	0.08	0.33
M ±SD	4.44±0.58	4.41 ±0.66	4.41±0.69	4.61±0.59				
Relationship with mother-in-law antenatally (N)	(26)	(44)	(36)	(166)	0.06	5.56	0.001*	0.65
M±SD	4.54±0.86	4.43 ±0.82	4.72±0.51	4.81±0.47				
Relationship with mother-in-law postnatally (N)	(26)	(44)	(37)	(165)	0.05	4.35	0.01*	0.59
M±SD	4.61±0.57	4.48 ±0.59	4.35±0.75	4.70±0.55				
Mode of delivery (N)	(20)	(33)	(21)	(115)	0.03	1.72	0.16	0.43
M±SD	1.30±0.66	1.58 ±0.83	1.43±0.68	1.29±0.62				
Complications during labour or afterwards (N)	(20)	(33)	(22)	(115)	0.007	0.46	0.71	0.32
M±SD	1.85±0.37	1.91 ±0.29	1.95±0.21	1.89±0.32				
Babies with medical problems (N)	(20)	(33)	(22)	(115)	0.01	0.71	0.55	0.37
M±SD	1.75±0.44	1.88 ±0.33	1.86±0.35	1.87±0.34				
Previous birth weight of infant (N)	(27)	(44)	(37)	(168)	0.03	2.90	0.04*	0.50
M±SD	1.81±0.74	1.61 ±0.65	1.84±0.60	1.91±0.56				
Medical care received during pregnancy and delivery (N)	(20)	(33)	(22)	(115)	0.03	1.74	0.16	0.12
M±SD	4.1±0.91	4±0.83	4.22±0.75	4.33±0.76				
MSSS total score (N)	(27)	(44)	(37)	(168)	0.1	10.01	<0.001 *	1.05
M±SD	25.15 ±3.96	26.64 ±3.22	27.57 ±2.58	27.94 ±2.23				
PSS total score (N)	(20)	(44)	(37)	(168)	0.33	44.18	<0.001 *	1.79
M±SD	18.33 ±4.77	20.5 ±4.41	14.76 ±4.68	12.39±4.5				

* Statistically significant at P ≤0.05
Group 1 = Antenatal depression; Group 2 = ante- and postnatal depression group; Group 3 = postnatal depression; Group 4 = Non-depression

partial η2 = 0.06, d = 0.65), total antenatal PSS score (F = 44.18; *P* = <0.001; partial η2 = 0.33, d = 1.79) and total postnatal PSS score (F = 30.29; *P* = <0.001; partial η2 = 0.25, d = 1.39).

As shown in Table 4, Tukey's honestly significant difference (HSD) test for multiple comparisons between the non-depression group and the three depressed groups found that health status among the non-depression group was not statistically significantly different from the three depressed groups (*P* = 0.91, d= 0.15; *P* = 0.23, d = 0.37; *P* = 0.33, d=0.35, respectively). There was a significant difference in relationships with the mother-in-law antenatally between the non- depression group and the ante- and postnatal depression group (mean difference = 0.38, *P* = 0.001, d= 0.57, 95 % C.I. = 0.12– 0.63), with this group having the worst relationships with their mothers-in-law. The non-depression group also showed better relationships with mothers-in-law post-natally (mean difference = 0.35, *p=0.01*, d=0.59, 95 % C.I. = 0.07–0.62) compared with the postnatal depression group. There was no statistically significant difference in relationships with the mothers-in-law antenatally between the non-depression group and the antenatal depression group (*P* = 0.13) or postnatal depression group (*P* = 0.86). There was no statistically significant difference in relationships with the mothers-in-law postnatally between the non-depression group and the antenatal depression group *(P* = 0.91) or the ante- and postnatal depression group.

There was also a statistically significant difference in the relationship with the husband's family antenatally between the non-depression group and the antenatal depression group (mean difference = 0.38, *P* = 0.01, d= 0.51, 95 % C.I. = 0.06 – 0.70), as this group reported the worst relationships. There was no statistically significant difference in the relationship with the husband's family antenatally between the non-depression group and the other depressed groups, either the ante- and postnatal depression group (*P* = 0.06) or the postnatal depression group (*P* = 0.95). The non-depression group also showed significant difference in the birth weights of their infants (*P* = 0.02, d=0.50) compared with the ante- and postnatal depression group, as this depressed group had the lowest baby birth weights (<2500g).

There was also a statistically significant difference in the total antenatal MSSS scores between the non-depression group and the depressed groups: the antenatal depression group (mean difference = 2.79, *P* <0.001, d = 0.87, 95 % C.I. = 1.37– 4.22); and the ante- and postnatal depression group (mean difference = 1.30, *P* <0.021, d = 0.47, 95 % C.I. = 0.14 – 2.47). However, there was no statistically significant difference between non-depression group and the postnatal depression group (*P* = 0.87). The non-depression group had the highest antenatal maternity social support of the four groups. With regard to the total postnatal MSSS scores, there was only a statistically significant difference between the non-depression group and the ante- and postnatal depression group (mean difference = 2.67, *P* = 0.001, d = 0.63, 95 % C.I. = 0.87 – 4.47). The non-depression group reported more postnatal

Table 4
Tukey's honestly significant difference (HSD) test for multiple comparisons between the non-depressed group and the three depressed groups.

(I)	(J)	Variable	Mean Difference (I-J)	Std. Error	Sig.	Cohen's d	95 % Confidence Interval Lower Bound	Upper Bound
Non-depression group	**Ante- and postnatal depression group**	Health status	0.12	0.06	0.23	0.37	-0.04	0.27
		Birth weight of infant	0.30	0.10	0.02*	0.50	0.04	0.56
		Relationship with mother-in-law antenatally	0.38	0.10	0.001*	0.57	0.12	0.63
		Relationship with husband's family antenatally	0.25	0.10	0.06	0.45	-0.01	0.51
		Relationship with mother-in-law postnatally	0.22	0.10	1.20	0.39	-0.04	0.48
		Antenatal PSS total score	-8.11	0.77	<0.001*	1.82	-10.10	-6.13
		Postnatal PSS total score	-7.23	0.88	<0.001*	1.52	-9.52	-4.95
		Antenatal MSSS total score	1.30	0.45	0.02*	0.47	0.14	2.47
		Postnatal MSSS total score	2.67	0.70	0.001*	0.63	0.87	4.47
	Antenatal depression group	Health status	0.05	0.07	0.91	0.15	-0.14	0.24
		Birth weight of infant	0.10	0.12	0.87	0.15	-0.22	0.42
		Relationship with mother-in-law antenatally	0.27	0.12	0.13	0.39	-0.05	0.59
		Relationship with husband's family antenatally	0.38	0.12	0.01*	0.51	0.06	0.69
		Relationship with mother-in-law postnatally	0.08	0.12	0.91	0.16	-0.24	0.40
		Antenatal PSS total score	-5.95	0.94	<0.001*	1.28	-8.38	-3.51
		Postnatal PSS total score	-2.51	1.08	0.10	0.43	-5.31	0.29
		Antenatal MSSS total score	2.79	0.55	<0.001*	0.87	1.37	4.22
		Postnatal MSSS total score	1.25	0.85	0.46	0.33	-0.95	3.45
	Postnatal depression group	Health status	-0.11	0.06	0.33	0.35	-0.28	0.06
		Birth weight of infant	0.07	0.11	0.91	0.12	-0.21	0.35
		Relationship with mother-in-law antenatally	0.09	0.11	0.86	0.18	-0.19	0.36
		Relationship with husband's family antenatally	0.06	0.11	0.95	0.11	-0.22	0.34
		Relationship with mother-in-law postnatally	0.35	0.11	0.01	0.59	0.07	0.62
		Antenatal PSS total score	-2.37	0.82	0.02*	0.52	-4.50	-0.24
		Postnatal PSS total score	-6.06	0.95	<0.001*	1.20	-8.51	-3.61
		Antenatal MSSS total score	0.37	0.48	0.87	0.15	-0.88	1.62
		Postnatal MSSS total score	1.26	0.75	0.33	0.33	-0.67	3.19

* significant post-hoc tests

maternity social support than the other groups.

In relation to the total antenatal PSS score, there was a statistically significant difference between the non-depression group and the three depressed groups: antenatal depression group (mean difference = -5.95, P <0.001, d = 1.28, 95 % C.I. = -8.38 – -3.51), antenatal and postnatal depression group (mean difference = -8.11, P <0.001, d = 1.82, 95% C. I. = -10.10 – -6.13), and postnatal depression group (mean difference = -2.37, P = 0.02, d = 0.52, 95 % C.I. = -4.50 – -0.24). The ante- and postnatal depression group were more stressed antenatally than the other groups.

For the total postnatal PSS scores, there was a statistically significant difference between the non-depression group and the depressed groups, which were the ante- and postnatal depression group (mean difference = -7.23, P <0.001, d = 1.52, 95 % C.I. = -9.52 – -4.95), and the postnatal depression group (mean difference = -6.06, P <0.001, d = 1.20, 95 % C. I. = -8.51 – -3.61). The ante- and postnatal depression group were more stressed postnatally than the postnatal depression group or the non-depression group.

Table 5 presents Tukey's HSD test for multiple comparisons between the three depressed groups, which showed that health status was significantly better in the ante- and postnatal depression group than the postnatal depression group (mean difference = -.22, P = 0.03, d = 0.63, 95 % C.I. = -0.43 – -0.02). There was no statistically significant difference between the depressed groups with regard to the relationship with their mothers-in-law. Likewise, there was no statistically significant difference between the depressed groups related to the relationship with the husband's family or baby birth weight.

Additionally, the postnatal depression group had higher total antenatal MSSS scores (mean difference = 2.42, P = 0.002, d = 0.72, 95 % C. I. = 0.68 – 4.16) than the antenatal depression group. However, there was no significant difference between the depressed groups relating to the total postnatal MSSS scores.

The antenatal depression group had significantly higher total antenatal PSS scores (mean difference = 3.58, P = 0.01, d = 0.76, 95 % C.I. = 0.61 – 6.55) than the postnatal depression group. However, there was no significant difference between the ante- and postnatal depression group and the antenatal depression group (P = 0.21).

Regarding the total postnatal PSS scores, the antenatal depression group had significantly lower scores for the total postnatal PSS than the postnatal depression group (mean difference =- 3.55, P = 0.04, d = 0.63, 95% C.I. = -6.96 – -0.13). The antenatal depression group had significantly lower total postnatal PSS scores than the ante- and postnatal depression group (mean difference =- 4.72, P <0.001, d = 0.89, 95 % C. I. = -8.02– -1.42).

Discussion

The present study, conducted among a group of Omani women, identified a probable antenatal depression prevalence rate of 27.12 % in the third trimester, with a 29.30 % prevalence of probable postnatal

Table 5
Tukey's honestly significant difference (HSD) test for multiple comparisons between the three depressed groups.

(I)	(J)	Variables	Mean Difference (I-J)	Std. Error	Sig.	Cohen d	95 % Confidence Interval	
							Lower Bound	Upper Bound
Ante- and postnatal depression group	**Non-depression group**	Health status	-0.12	0.06	0.23	0.37	-0.27	0.04
		Birth weight of infant	-0.30	0.10	0.02*	0.50	-0.56	-0.04
	Antenatal depression group	Health status	-0.07	0.09	0.88	0.22	-0.29	0.16
		Birth weight of infant	-0.20	0.15	0.52	0.29	-0.58	0.18
	Postnatal depression group	Health status	-0.22	0.08	0.03*	0.63	-0.43	-0.02
		Birth weight of infant	-0.22	0.13	0.34	0.37	-0.57	0.12
Postnatal depression group	**Non-depression group**	Husband's family relationship antenatally	-0.06	0.11	0.95	0.11	-0.34	0.22
		Antenatal total MSSS score	-0.37	0.48	0.87	0.15	-1.62	0.88
	Ante- and postnatal depression group	Husband's family relationship antenatally	0.19	0.13	0.46	0.34	-0.15	0.54
		Antenatal total MSSS score	0.93	0.59	0.40	0.32	-0.60	2.47
	Antenatal depression group	Husband's family relationship antenatally	0.32	0.15	0.16	0.42	-0.07	0.70
		Antenatal total MSSS score	2.42	0.67	0.002	0.72	0.68	4.16
Antenatal depression group	**Non-depression group**	Birth weight of infant	-0.10	0.12	0.87	0.15	-0.42	0.22
		Relationship with mother-in-law antenatally	-0.27	0.12	0.13	0.39	-0.59	0.05
		Relationship with mother-in-law postnatally	-0.08	0.12	0.91	0.16	-0.40	0.24
		Postnatal total MSSS score	-1.25	0.85	0.46	0.33	-3.45	0.95
		Antenatal total PSS score	5.95	0.94	<0.001*	1.28	3.51	8.38
		Postnatal total PSS score	2.51	1.08	0.10	0.43	-0.29	5.31
	Ante- and postnatal depression group	Relationship with mother-in-law antenatally	0.11	0.15	0.88	0.13	-0.27	0.48
		Relationship with mother-in-law postnatally	0.14	0.15	0.78	0.22	-0.24	0.51
		Postnatal total MSSS score	1.42	1.00	0.49	0.41	-1.18	4.02
		Antenatal total PSS score	-2.17	1.11	0.21	0.47	-5.04	0.70
		Postnatal total PSS score	-4.72	1.28	<0.001*	0.89	-8.02	-1.42
	Postnatal depression group	Birth weight of infant	-0.02	0.15	1.00	0.05	-0.41	0.37
		Relationship with mother-in-law antenatally	-0.18	0.15	0.62	0.26	-0.57	0.21
		Relationship with mother-in-law postnatally	0.26	0.15	0.30	0.38	-0.12	0.65
		Postnatal total MSSS score	0.01	1.04	1.00	0.003	-2.68	2.70
		Antenatal total PSS score	3.58	1.15	0.01*	0.76	0.61	6.55
		Postnatal total PSS score	-3.55	1.32	0.04*	0.63	-6.96	-0.13

* Significant post-hoc tests

depression two to eight weeks after delivery. The rates of perinatal depression in Oman noted in this study are higher than those reported in high income countries (HICs), such as England (Evans et al., 2001), Australia (Leigh & Milgrom, 2008) and Japan (Kitamura et al., 2006) and even in other Arabic countries with similar sociodemographic and cultural characteristics to the site of the current study, such as Jordan (Mohammad et al., 2011), the UAE (Hamdan & Tamim, 2011) and Qatar (Burgut et al., 2013), as well as previous studies from Oman (Al-Azri et al., 2016; Al Hinai & Al Hinai, 2014; Al Rawahi et al., 2020). However, the rates of perinatal depression reported in the current study were lower than in some other Arabic countries, such as Egypt (Ahmed et al., 2021) and Saudi Arabia (Al Nasr et al., 2020). The variances in rates across these studies may be related to discrepancies in the methodology used (such as study design, screening tools versus diagnosis, etc.) and the length of the perinatal period focused on (Al-abri et al., 2023).

In this study, differences in depressive symptoms was found between the four identified groups. The timing and duration of depressive symptoms are likely to be associated with a variety of risk factors (Mora et al., 2009). In the current study, 14.38 % of mothers who were depressed in the third trimester of their pregnancy continued to be depressed postnatally. A previous longitudinal study from New Zealand revealed a much lower rate than the current study, with only 3 % of women showing depressive symptoms during the third trimester of pregnancy also being depressed nine months after delivery (Underwood et al., 2017). In contrast, the results from a previous longitudinal study from rural Pakistan showed that 56 % of mothers who were depressed in the third trimester of pregnancy continued to be depressed one year after delivery (Rahman & Creed, 2007). The high rate noted in Rahman & Creed's study could be due to the rural setting, which in Pakistan is associated with higher rates of depression compared to urban populations, according to Husain's study (Husain et al., 2011), where 38.3 % of mothers show persistent depression from the antenatal into the postnatal period. In rural areas, mothers are noted to be less educated and are poorer, and these factors could both lead to persistent depression (Husain et al., 2011). The current study was based in Muscat, the capital city of Oman, one of the HICs, which has better healthcare facilities compared to lower-income countries, and where women are likely to be better educated, with 59.80 % of participants in this study having completed a university qualification.

Results from previous longitudinal studies reflect some of the findings from the current study, namely that perinatal depression is significantly associated with high levels of psychological distress or stressful life events (Abdollahi et al., 2017; Husain et al., 2011; Rubertsson et al., 2005; Underwood et al., 2017), antenatal depression (Al Rawahi et al., 2020; Dørheim et al., 2014; Milgrom et al., 2008; Underwood et al., 2017), and low social support (Milgrom et al., 2008). Rahman and Creed (2007) noted similar risk factors, such as experiencing stressful life events, but also noted new risk factors, such as the education level of the husband, lack of confidence and/or having few friends, and poverty levels.

In this study, the relationship with the mother-in-law was found to be significantly associated with perinatal depressive symptoms, with the worst relationships being noted in the group of women who were depressed antenatally and stayed depressed. This finding is supported by many other studies from Arabic countries (Bener et al., 2012; Green et al., 2006; Mohammad et al., 2011). Traditionally, Omani women move into their husbands' family home after marriage, but after giving birth most women return to their own families to receive care and support from their mothers during the first 40 days postnatally, returning to their husbands' family home after this. After marriage, men in Oman remain strongly attached to their families, often continuing to live in their parents' home and even working within the family business their whole lives. Mothers-in-law frequently exert significant control over the lives of their sons, daughters-in-law and even future grandchildren (Green et al., 2006). It has been reported that, as a result, women who have healthy relationships with their mothers-in-law have more successful marriages (Green et al., 2006).

Many pregnancy risk factors, such as unplanned pregnancy and obstetric complications such as bleeding during and after labour, or issues with the baby's health or mode of delivery, were not found to be associated with perinatal depressive symptoms in the current study. There are limited data on the impact of obstetric factors on the development of perinatal depressive symptoms (Parker, 2004), and the limited findings available, such as the effect of medical complications during pregnancy or a difficult labour, are conflicting. While some studies have found that obstetric complications were associated with the development of perinatal depressive symptoms (Bener, Burgut, et al., 2012; Josefsson et al., 2002; Mohammad et al., 2011), some studies have found no association, or that those findings were not fully supported (Al Hinai & Al Hinai, 2014; Chandran et al., 2002; Nielsen et al., 2000).

In the current study, health status was significantly associated with perinatal depressive symptoms, both in the group who had postnatal depressive symptoms only and in women who had ante-and postnatal depression symptoms. This is supported by recent evidence which found that chronic medical conditions were significantly associated with perinatal depression (adjusted pooled odds ratio (aPOR) = 1.45; 95 % CI: 1.25-1.67), specifically: diabetes (aPOR = 1.34; 95 % CI: 1.07-1.69); hypertension/heart disease (aPOR = 1.60; 95 % CI: 1.05-2.45); migraine (aPOR = 1.75; 95 % CI: 1.20-2.54); and other neurological disorders (aPOR = 1.45; 95 % CI: 1.19-1.77) (Brown et al., 2018). However, in the current study, around 85 % of women responded that they had no medical problems, so the sample was too small to measure the potential effects of these conditions.

The birth weight of the infant was significantly associated with a greater risk of perinatal depressive symptoms in this study, with the group who were depressed antenatally and stayed depressed having the highest number of infants with low birth weight. This is in agreement with another study conducted in Egypt (Mohammed et al., 2014), which found that women who had low birth weight babies were significantly more likely to suffer from perinatal depression (Mohammed et al., 2014). Another study found that mothers of very low birth weight children (less than 1500 g) experienced more personal and family stress, as well as higher levels of child-related stress, compared to mothers who gave birth at full term (Singer et al., 2010).

Various sociodemographic variables, including maternal age, age at first marriage and level of education, are generally recognised as risk factors for perinatal depressive symptoms (Al Hinai & Al Hinai, 2014; Bener, Gerber, & Sheikh, 2012; Chaaya et al., 2002; Green et al., 2006), though they did not seem to influence any of the changes in depressive symptoms in the present study. Notably, most studies of perinatal depression risk factors compare depressed women to non-depressed women on a cross-sectional basis (Sutter-Dallay et al., 2012). In the current study, depressive symptoms were studied transitionally from pregnancy to two to eight weeks postnatally, leading to relatively small groups, particularly the antenatal depression group (27 patients), potentially reducing the power of the analysis.

Unlike the findings of previous studies (Beck, 2001; Özcan et al., 2017), psychiatric illness in the form of a personal/family history of depression was found to not be associated with perinatal depressive symptoms in the current study. Previous studies within Arabic populations also noted this to not be a risk factor for perinatal depression (Ahmed et al., 2021; Mohammad et al., 2011). This could be explained by the lack of awareness regarding psychiatric illness or due to the societal stigma of mental illness in Oman, as in many other Arabic countries (Al-Adawi, 2017). Mental illness stigma impacts all ethnic groups, contributing to limiting access to care and support (Mantovani, Pizzolati, & Edge, 2017). When nurses and midwives first encounter their pregnant patients, they should be cautious and assess both the woman and her family for a history of psychiatric illnesses. Regular encounters and peer support groups can be beneficial for pregnant women who have a history of mental illness (Özcan et al., 2017).

Limitations

To the best of our knowledge, this study is the first longitudinal study assessing the changes in perinatal depression among Omani women in the primary care setting, which may be representative of other Middle Eastern populations sharing similar sociodemographic characteristics. This study aimed to address the gaps in previous research by examining distinct groups with changes in depression and their association with various risk factors. However, this study has some limitations. First, the outcome was based on self-reported questionnaires and, as a result, there is a risk of reporting bias or misinterpretation of the questions. Secondly, the EPDS (Cox et al., 1987) is a self-reported screening tool rather than a diagnostic tool, which could lead to overestimation or underestimation of the true prevalence of depression (Underwood et al., 2016). Thirdly, 10 % of women who were recruited late in pregnancy dropped out. Although there were no significant variations in features between mothers who responded during the postnatal period and those who did not, a brief follow-up during a homecare visit was required to collect postnatal data from women who did not respond during the postnatal period to reduce selection bias. Lastly, this study did not assess other possible variables, such as drug and substance abuse history or abusive relationships, which may be additional risk factors for developing perinatal depression.

Clinical implications

High rates of depressive symptoms have negative impacts on obstetric and neonatal outcomes (Lee & Chung, 2007), and therefore it is crucial that healthcare professionals such as nurses and midwives should consider initial screening to identify pregnant and postnatal women with depressive symptoms as part of routine screening in perinatal clinics. This would help to identify women who are at high risk of depression and enable healthcare professionals to follow them up during the perinatal period, and implement therapeutic interventions, in turn reducing the risk of negative consequences of perinatal depression on the mothers and their babies. Early and successful management of perinatal depression can be ensured by providing recommended screenings and appropriate referrals for diagnosis, treatment and follow-up care (Bauman et al., 2020), thus providing a window for early intervention. The study also revealed risk factors for developing perinatal depressive symptoms, such as high perceived stress and inadequate social support, suggesting that HCPs should be encouraged on how to educate and support women during the pregnancy and postnatal period. It is critical that, where appropriate, GPs refer pregnant women to specialized psychologists for psychotherapy treatments.

The most typical familial conflict noted in this study was between the women and their mothers-in-law, which is an important relationship in collectivist cultures, such as Asian and Arabic societies (Duan et al., 2020). This conflict can exacerbate family disharmony and have a significant impact on marital satisfaction between married couples (Duan et al., 2020), resulting in high levels of stress and a lack of support, raising the risk of perinatal depression. As a result, greater emphasis should be placed on the family network and relationships between family members, with the goal of creating a harmonious atmosphere inside the family (Duan et al., 2020). If there is maternal dissatisfaction with the relationship with her mother-in-law, interventions should be aimed at the entire family (Duan et al., 2020). This disharmony should be recognised prior to or during pregnancy, and could be identified using screening scales, such as the MSSS, during pregnancy appointments. In addition, healthcare professionals should offer psycho-education and culturally relevant counselling as part of public health education (Xiong et al., 2018). Moreover, Family therapy interventions should be included in Oman's primary healthcare system as a potential strategy for increasing family support by focusing on communication skills related to expectations (such as those pertaining to the role of the mother-in-law within the family and what she expects her daughter-in-law to do to promote healthy relationships within the family) and emotional support, conflict resolution, and problem-solving skills.

Conclusions

The current findings highlight that different groups of women in various stages of perinatal depression appear to be influenced by psychosocial and obstetric factors, which were comparable to those identified in more regularly studied populations. However, this study identified other novel factors, such as the quality of family relationships. Early detection of depression, as well as social and family support and counselling, could help to prevent a long-term pattern of chronic and/or recurrent depression during the perinatal period. Additional research is required to determine whether there are other cultural elements that could influence changes in depression in the various groups. More research is also needed to identify further correlates of perinatal depressive symptoms in the various groups of perinatal women that experience changes in depressive symptoms, such as drug and substance abuse history or abusive relationships, as well as preventative techniques and treatments that target modifiable factors, including relationships and family problems. Furthermore, while this study relies on the EPDS tool to identify depressive symptoms and is valid in other Arab countries but not in Oman, further study is needed to validate this tool among Omani population.

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Ethics statement

This study obtained ethical approval from the University of Manchester, University Research Ethics Committee (UREC) (2020-6906-13327), the Medical Research Ethics Committee (MREC) at Sultan Qaboos University (SQU.EC/020/20) and Research and Ethical Review and Approval Committee, Ministry of Health in Oman (MOH/CSR/19/11135).

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Khalood Al-abri: Conceptualization, Formal analysis, Data curation, Writing – original draft, Writing – review & editing. **Dawn Edge:** Conceptualization, Methodology, Writing – review & editing. **Christopher J. Armitage:** Conceptualization, Methodology, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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