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The mediational role of social support in the relationship between stress and antenatal anxiety and depressive symptoms among Australian women: a mediational analysis

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Abstract

Background: Pregnancy can be a stressful period for most women and their family members, and the mental wellbeing of pregnant women can face serious challenges. Social support can play a role in improving the psychological well-being of pregnant women by enhancing the stress coping ability and alleviating stressful conditions. The current study aimed to assess the mediating effects of social support in the relationship between perceived stress and depressive symptoms as well as anxiety symptoms during pregnancy among Australian women.

Methods: Of the 8,010 women who completed Survey 6 of the 1973–78 Australian Longitudinal Study on Women's Health (ALSWH) cohort in 2012, those who reported being pregnant (n = 493) were included in the current analyses. Antenatal depressive and anxiety symptoms were assessed using the 10 item Center for Epidemiological Studies Depression (CES-D-10) scale, and the 9-item Goldberg Anxiety and Depression scale (GADS) respectively. The 19 item-Medical Outcomes Study Social Support index (MOSS) was used to examine social support. A parallel mediation model was used to explore the mediational role of each domain of social support between perceived stress and antenatal depressive and anxiety symptoms.

Result: The study found that emotional/informational support has a partial mediating effect on the relationship between perceived stress and antenatal depressive symptoms (β = 0.371, 95% CI: 0.067, 0.799) and on the relationship between perceived stress and antenatal anxiety symptoms (β = 0.217, 95% CI: 0.029, 0.462). Affectionate support/positive social interaction and tangible support was found to play no significant mediation role between stress and antenatal depressive and anxiety symptoms.

Conclusions: Emotional/informational support appears to play a mediating role in the relationship between stress and antenatal depressive as well as between stress and antenatal anxiety symptoms. In order to further protect pregnant women from the effects of stress, policy makers and maternal health professionals are advised to develop

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community-based social support programs to enhance prenatal psychosocial support and ensure pregnant women have adequate emotional/information support.

Keywords: Stress, Depressive symptoms, Anxiety symptoms, Social support, Pregnancy, Mediation

Plain language summary

Social support is a resource or a means that an individual can use to cope with stressful events and improve psychological wellbeing. It improves emotional and physical well-being and promotes health for a successful pregnancy. However, the relationship between domains of social support and antenatal depressive and anxiety symptoms remains understudied in Australia. Therefore, our study intended to examine the mediating role of domains of social support in the linkage between stress and depressive and anxiety symptoms during pregnancy among Australian Women.

Data were obtained from Survey 6 of the 1973–78 ALSWH cohort, which was conducted in 2012, and those who reported being pregnant were part of the study (n = 493, aged 34–39 years). Social support provided for a pregnant woman was the outcome variable, assessed using the 19-item Medical Outcomes Study Social Support index (MOS-SSS-19 item). A parallel mediation model was used to explore the mediational role of each domain of social support between perceived stress and antenatal depressive and anxiety symptoms.

Emotional/informational support plays a mediating role in the relationship between stress and antenatal depressive as well as between stress and antenatal anxiety symptoms. So, to further protect pregnant women from the effect of stress, policymakers and maternal health professionals are advised to develop community-based social support programs.

Background

Pregnancy is accompanied by changes to a woman's body hormones, physical appearance, lifestyle, roles and responsibilities [1, 2]. Such changes can cause stress in pregnant women [3] and lead to an increased risk of developing mental health problems such as depressive symptoms [2], and anxiety symptoms [4].

Depression and anxiety are among the most prevalent mental health problems experienced by pregnant women [5, 6]. An estimated prevalence of antenatal depression reported by studies conducted in Australia ranges from 6–7% [7, 8] to 16.9% [9], while the prevalence of antenatal anxiety in Australia ranges from 14–59% [10–15]. Depression and anxiety during pregnancy adversely affect several obstetric and foetal outcomes and cause an increased rate of pregnancy complications and postnatal mental health problems [16–19]. Untreated antenatal anxiety and depression may lead to postnatal depression for the mother which may also result in an impaired interaction with her infant [20–22].

Social support is a resource or a means that an individual can use to cope with stressful events and improve psychological wellbeing [23]. It is defined as the provision of emotional, informational, affectionate, and tangible (i.e. financial or instrumental) support for somebody by the available social network (i.e. family members, friends, and/or community members) [24]. Social support can strengthen social relationships and promotes health and well-being for a successful pregnancy [25].

Different hypotheses have suggested several mechanisms of action of social support in preventing prenatal mental health problems. First, social support plays a stress-buffering role which directly contributes to the well-being of individuals by enhancing positive affect and/or perceived self-worth of individuals and indirectly improves well-being by alleviating stressful conditions [26]. Second, per the psycho-neuroimmunology (PNI) framework [27], social support can change negative responses related to stress, which help individuals to improve their problem-solving skill and develop a positive view about themselves[28, 29]. Third, the behavioural mechanism approach also considered social support as the support needed during a stressful event to enhance the stress coping ability, which in turn reduces the risk of mental illness [30]. The psychosocial stress hypothesis suggested social support as a preventive factor to reduce the risk of prenatal depression [31] and anxiety [32] and depressive symptoms in the general population [33–35].

The stress-buffering hypothesis supports the mediating role of social support in the linkage between stress and antenatal depressive and antenatal anxiety symptoms, which hypothesizes that social support can protect people facing stress from developing mental health problems, such as depression and anxiety [23]. This mediating effect may change an individual's perceptions about undesirable events, and provide solutions by encouraging changes in an individual's adaptive responses [36] and assist people in getting the skills required to buffer the effects of

stressors [37], subsequently, the occurrence of adverse consequences will be less likely [38].

Although few studies have identified that overall social support has a mediating effect on the linkage between stress and risk of developing mental illness during pregnancy [39, 40], the linkage between specific domains of social support (emotional/informational support, affectionate support and tangible support) and depressive and anxiety symptoms during pregnancy needs further investigation among pregnant women. In response, the study reported here aimed to directly fill this knowledge gap by examining the mediating role of emotional/informational support, affectionate support/positive social interaction and tangible support in the linkage between stress and depressive and anxiety symptoms among pregnant Australian Women using nationally representative secondary data from the 1973–78 ALSWH cohort.

Methods

Study design and data source

This study used data from the 1973–78 cohort of the Australian Longitudinal Study on Women's Health (ALSWH) [41, 42]. The ALSWH is an ongoing nationally representative community-based longitudinal study focusing on the health and well-being of Australian women. Over 40,000 women were recruited to participate in 1996 (baseline) in three age cohorts (birth year: 1973–78, 1946–51 and 1921–26). Participants were selected randomly via the national health insurance database (Medicare) and asked to complete mailed surveys every 3 years on average. Of the 8,010 women who completed Survey 6 of the 1973–78 cohort in 2012 (age between 34–39 years), those who reported being pregnant (n = 493) were included in the current analyses [43].

Measurement

Depression was assessed using the 10-item Center for Epidemiological Studies Depression (CES-D-10) scale and has good reliability (α = 0.79) [44]. Items were summed to form a total score, ranging from 0 to 30, with higher scores indicating a greater level of depressive symptoms. The CES-D-10 has been used to examine depressive symptoms during pregnancy with good reliability and validity [45–49]. Anxiety symptoms were assessed using the 9-item anxiety subscale of the Goldberg Anxiety and Depression scale (GADS). Items were summed to form a total score, ranging from 0 to 9, with higher scores indicating a greater level of anxiety symptoms. The scale has good reliability (α = 0.77) [50].

The Medical Outcomes Study Social Support index (MOS-SSS-19) was used to examine social support given to pregnant women. The MOS-SSS-19 has an overall index of 19 items (Cronbach's alpha 0.81), with higher scores indicating greater social support. The MOS-SSS-19 has three functional support subscales: emotional/informational support, tangible support, affectionate support/positive social interaction [51]. The level of stress in the last 12 months among study participants was assessed using the Perceived Stress Questionnaire, which has been developed and validated for the ALSWH study [52]. The tool examined the level of perceived stress in specific areas of life, including study, relationships and own health. An overall mean stress score was determined, which ranges from 0 (no stress) to 4 (extreme stress). The Perceived Stress Questionnaire has good internal reliability (α = 0.75) [53, 54].

Mediation model

This study used the stress-buffering hypothesis [26] to explore the mediational role of social support in the relationship between perceived stress, domains of social support and prenatal depressive or anxiety symptoms (Fig. 1). The stress-buffering hypothesis suggests that social support directly contributed to the well-being of individuals by enhancing positive affect and perceived self-worth (main effect). However, social support may also indirectly improve the well-being of individuals by alleviating stressful conditions or by reducing the impacts of stressful situations (buffering effect) [26].

During the application of the stress-buffering hypothesis, we expected that pregnant mothers with increased levels of stress would have a higher risk of depressive or anxiety symptoms. In contrast, it is expected that pregnant women with high social support would have less risk of antenatal depressive or anxiety symptoms. Finally, we hypothesized that social support would mediate or intervene in the effects of levels of stress on antenatal depressive or antenatal anxiety symptoms.

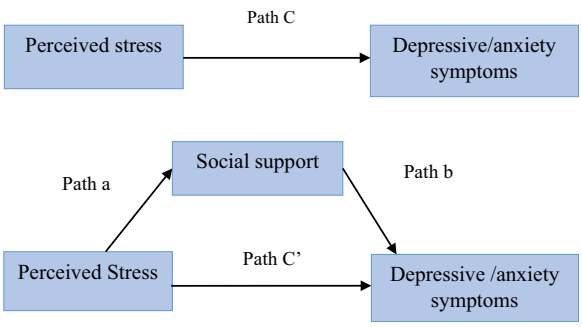

Fig. 1 The stress-buffering model as the main hypothesis of this study

Data analysis

The statistical software package SPSS Statistics 26.0 was used for all analyses. The one-way ANOVA and independent-sample t-test were used to examine group mean differences of continuous variables. In addition, an initial correlational analysis was used to test the relationships between stress, domains of social support, and antenatal depressive symptoms and antenatal anxiety symptoms.

The mediational role of social support between perceived stress and antenatal depressive and anxiety symptoms was examined using a mediational analysis model which is conducted using PROCESS macro (version 3.0) for SPSS. For a variable to be considered as a mediator, it should fulfil the following criteria: (1) the independent variables (stress) should have a strong association with dependent variables (anxiety and/or depression); (2) the independent variables should be strongly related to a mediator (emotional/informational support, affectionate support and tangible support); and (3) independent variables and mediator should be related to outcome variables. However, if the independent variable is no longer significant when the mediator variable is controlled, the finding will be a full mediation effect. If the independent variable still shows significant association when the mediator is controlled, the finding can be considered as a partial mediation effect [55].

Therefore, a 3-step analysis was performed to test the mediating effects of social support in the relationship between stress and antenatal depressive symptoms and antenatal anxiety symptoms. In the first step, each domain of social support is regressed on stress. In the second step, antenatal depressive symptoms and antenatal anxiety symptoms regressed on stress separately. In the third step, the outcome variables (antenatal depressive symptoms and antenatal anxiety symptoms) are regressed on stress and domains of social support separately. The total effect (path c), indirect effects (path a*b) and direct effects (path c') were reported in the form of unstandardized beta coefficients (β). The bootstrapping procedures in the SPSS PROCESS macro from the parallel mediation model 4 were used to test the significance of the indirect effects of stress on antenatal depressive symptoms and antenatal anxiety symptoms through the mediation of each domain of social support [56]. The mediation effect is significant ($p < 0.05$) if the 95% confidence interval (CI) for the result of the mediation effect did not contain zero. During the analysis, multicollinearity is not considered a problem if the Variance inflation factor (VIF) values are less than 5 [57].

Result

Demographic characteristics of pregnant women and group mean differences in stress, social support, depressive and anxiety symptoms are shown in Table 1. The mean (Standard Deviation) age of the participants was 35.8 years (1.4) and the majority of participants (65.7%) were between the age of 34–36 years, (95.1%) were married/in a de facto relationship, while (65%) achieved a university degree. The majority of the women (42%) were in the last trimester of their pregnancy, while 37.5% and 20.5% were in the second and first trimester respectively.

Marital status was found to be significantly related with domains of social support, and pregnant women who are married/in a de facto relationship reported a higher score of emotional/informational ($p < 0.001$), affectionate ($p < 0.001$) and tangible support ($p < 0.001$) than those with divorced/single/separated marital status. Also, pregnant women who can easily manage on income available presented less stress level ($p < 0.001$), less depressive ($p < 0.001$) and anxiety symptoms ($p < 0.001$) and a higher score of emotional ($p < 0.001$), affectionate ($p < 0.001$) and tangible support ($p < 0.001$).

Correlations among continuous variables

Table 2 presents the results of the correlation analysis. Prior to conducting mediational analysis, it is necessary to check whether the independent, mediating and dependent variables are correlated with each other. Perceived stress was negatively related to emotional/informational support ($r = -0.398$, $p < 0.001$), affectionate support ($r = -0.433$, $p < 0.001$) and tangible support ($r = -0.321$, $p < 0.001$), and positively related with depressive ($r = 0.557$, $p < 0.001$), and anxiety symptoms ($r = 0.560$, $p < 0.001$). Depressive symptoms were negatively related to emotional/informational support ($r = -0.471$, $p < 0.001$), affectionate support ($r = -0.454$, $p < 0.001$) and tangible support ($r = -0.359$, $p < 0.001$). Similarly, anxiety symptoms were negatively related to emotional/informational support ($r = -0.369$, $p < 0.001$), affectionate support ($r = -0.359$, $p < 0.001$) and tangible support ($r = -0.289$, $p < 0.001$). These bivariate correlations support the following mediation analyses.

The mediational role of social support

The first mediational analysis was performed to examine the mediational role of social support on the linkage between stress and antenatal depressive symptoms. The results presents in Table 3 show that the total effect of stress on antenatal depressive symptoms was statistically significant ($\beta = 4.021$, $p < 0.001$). With the inclusion of the mediating variables (emotional support/informational support, affectionate support/positive social

Table 1 Relationship between demographic characteristics and stress, social support as well as antenatal depressive and anxiety symptoms among Australian women, 2021

Variables	n (%)	Stress (mean ± SD)	Social support (mean ± SD)			Anxiety symptoms (mean ± SD)	Depressive symptoms (mean ± SD)
			Emotional support	Affectionate support	Tangible support		
Age							
34–36	324 (65.7)	0.57 (0.397)	4.41 (0.735)	4.57 (0.586)	4.29 (0.798)	3.43 (2.447)	5.23 (4.262)
37–39	169 (34.3)	0.68 (0.471)	4.23 (0.868)	4.36 (0.776)	4.09 (0.857)	3.43 (2.288)	5.78 (4.278)
P-value		0.008	0.022	0.001	0.012	0.994	0.178
Stage of pregnancy							
< 3 month	101 (20.5)	0.51 (0.386)	4.41 (0.735)	4.52 (0.611)	4.25 (0.799)	3.40 (2.350)	5.23 (0.897)
3–6 month	185 (37.5)	0.64 (0.424)	4.27 (0.840)	4.44 (0.695)	4.19 (0.856)	3.54 (2.512)	5.30 (4.466)
> 6 month	207 (42)	0.442 (0.031)	4.38 (0.759)	4.54 (0.662)	4.23 (0.808)	3.34 (2.307)	5.63 (4.267)
P-value		0.042	0.266	0.367	0.816	0.717	0.664
Highest qualification							
University	319 (65)	0.60 (0.412)	4.38 (0.752)	4.53 (0.646)	4.23 (0.826)	3.33 (2.321)	5.19 (4.071)
Certificate/ diploma or trade/apprenticeship	112 (22.8)	0.65 (0.452)	4.29 (0.835)	4.47 (0.698)	4.26 (0.749)	3.69 (2.479)	5.76 (4.652)
School only	60 (12.2)	0.58 (0.457)	4.26 (0.873)	4.39 (0.698)	4.09 (0.934)	3.52 (2.561)	5.99 (4.576)
P-value		0.492	0.439	0.298	0.383	0.389	0.268
Marital status							
Married/De facto relationship	468 (95.1)	0.60 (0.426)	4.38 (0.765)	4.52 (0.649)	4.25 (0.802)	3.43 (2.396)	5.34 (4.222)
Divorced/single/separated	24 (4.9)	0.74 (0.426)	3.78 (0.990)	3.99 (0.770)	3.59 (0.989)	3.50 (2.207)	7.06 (4.945)
P-value		0.108	< 0.001	< 0.001	< 0.001	0.893	0.054
Able to manage on income available							
Impossible/Difficult all of the time	43 (8.8)	1.06 (0.612)	3.57 (1.215)	3.91 (0.931)	3.60 (1.059)	5.10 (2.424)	9.42 (5.406)
Difficult some of the time	118 (24)	0.69 (0.416)	4.35 (0.715)	4.50 (0.602)	4.18 (0.870)	3.76 (2.367)	5.95 (4.632)
Not too bad/It is easy	330 (67.2)	0.52 (0.353)	4.45 (0.680)	4.57 (0.606)	4.32 (0.733)	3.09 (2.278)	4.70 (3.625)
P-value		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

SD Standard deviation

Table 2 Correlations between age, stress, domains of social support, antenatal depressive symptoms and antenatal anxiety symptoms among Australian women, 2021

S.no		Mean ± SD	1	2	3	4	5	6
1	Age	35.8 (± 1.4)	1					
2	Perceived Stress	0.61 (0.42)	0.067	2				
3	Antenatal depression symptoms	5.42 (4.27)	0.062	0.557**	3			
4	Antenatal anxiety symptoms	3.43 (2.39)	− 0.002	0.560**	0.665**	4		
5	Emotional/Informational support	4.35 (0.78)	− 0.119**	− 0.398**	− 0.471**	− 0.369**	5	
6	Affectionate support/Positive social interaction	4.50 (0.66)	− 0.168**	− 0.433**	− 0.454**	− 0.359**	0.828**	6
7	Tangible support	4.22 (0.82)	− 0.139**	− 0.321**	− 0.359**	− 0.289**	0.676**	0.673**

**Correlation is significant at the p < 0.01 level (2-tailed)

Table 3 Bootstrapping indirect effects and 95% confidence intervals (CI) for the mediational analysis in the relationship between perceived stress and antenatal depressive and anxiety symptoms among Australian women, 2021

Effect	SE	β coefficient (effect)	*P*-value	95% CI
Indirect effect (a*b)				
Perceived stress → Emotional/informational support → depressive symptoms‡	0.189	0.371	–	(0.067, 0.799)*
Perceived tress → Affectionate support/positive social interaction → depressive symptoms‡	0.184	0.044	–	(− 0.325, 0.405)
Perceived tress → Tangible support → depressive symptoms‡	0.102	0.056	–	(− 0.142, 0.274)
Perceived tress → emotinal/informational support → anxiety symptoms¥	0.113	0.217	–	(0.029, 0.462)*
Perceived tress → affectionate support/positive social interaction → anxiety symptoms¥	0.109	− 0.012	–	(− 0.239, 0.198)
Perceived tress → tangible support → anxiety symptoms¥	0.067	0.053	–	(− 0.079, 0.194)
Direct effect (c') s				
Perceived tress → depressive symptoms	0.428	3.549	< 0.001	(2.708, 4.391)*
Perceived tress → anxiety symptoms	0.246	2.688	< 0.001	(2.204, 3.172)*
Total effect (c)				
Perceived tress → depressive symptoms	0.428	4.021	< 0.001	(3.180, 4.863)*
Perceived tress → anxiety symptoms	0.239	2.947	< 0.001	(2.477, 3.417)*

‡ Model adjusted for sociodemographic factors (Age, marital status), stage of pregnancy, and history of miscarriage, life satisfaction and optimism

¥ Model adjusted for sociodemographic factors (Age, marital status), stage of pregnancy, history of miscarriage, and life satisfaction

*$P < 0.001$

interaction and tangible support), the effect of stress on antenatal depressive symptoms reduced but remained statistically significant (β = 3.549, p < 0.001). The indirect effect of perceived stress on antenatal depressive symptoms through affectionate support/positive social interaction (β = 0.044, 95% CI: − 0.325, 0.405) and tangible support (β = 0.056, 95% CI: − 0.142, 0.274) was statistically non-significant. However, the indirect effect of perceived stress on antenatal depressive symptoms through emotional/informational social support was found to be statistically significant (β = 0.371, 95% CI: 0.067, 0.799). This implies the relationship between perceived stress and antenatal depressive symptoms is partially mediated by emotional/informational support. The display of the parallel mediation model was presented in Fig. 2.

Similarly, a mediational analysis was performed to examine the mediational role of social support on the relationship between perceived stress and antenatal anxiety symptoms. The results revealed that the total effect of perceived stress on antenatal anxiety symptoms was statistically significant (β = 2.947, p < 0.001) (Table 3). With the inclusion of the mediating variables (emotional support/informational support, affectionate support/positive social interaction and tangible support), the effect of perceived stress on antenatal anxiety symptoms was slightly reduced but remained statistically significant (β = 2.688, p < 0.001). The indirect effect of perceived stress on antenatal anxiety symptoms through emotional/informational social support was statistically significant (β = 0.217, 95% CI: 0.029, 0.462). Therefore, the

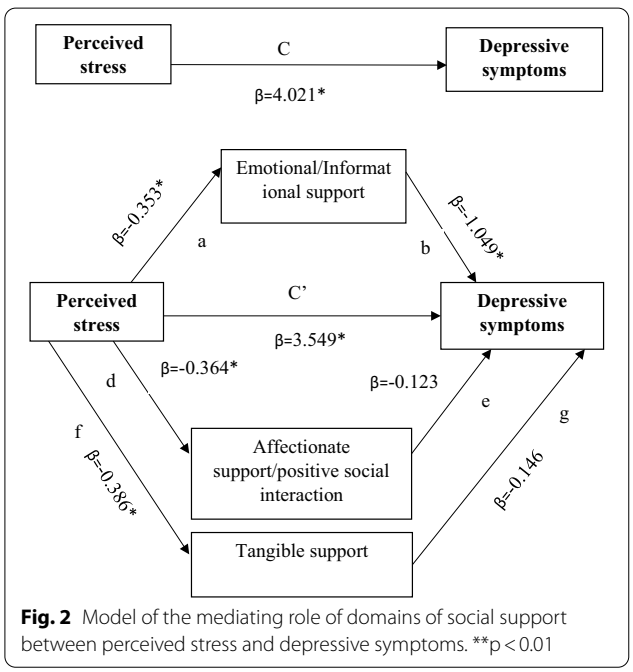

Fig. 2 Model of the mediating role of domains of social support between perceived stress and depressive symptoms. **p < 0.01

finding demonstrated that the relationship between perceived stress and antenatal anxiety symptoms is partially mediated by emotional/informational support. However, the indirect effect of perceived stress on antenatal anxiety symptoms through affectionate support/positive social interaction (β = − 0.012, 95% CI: − 0.239, 0.198) and tangible support (β = 0.053, 95% CI: − 0.079, 0.194)) was

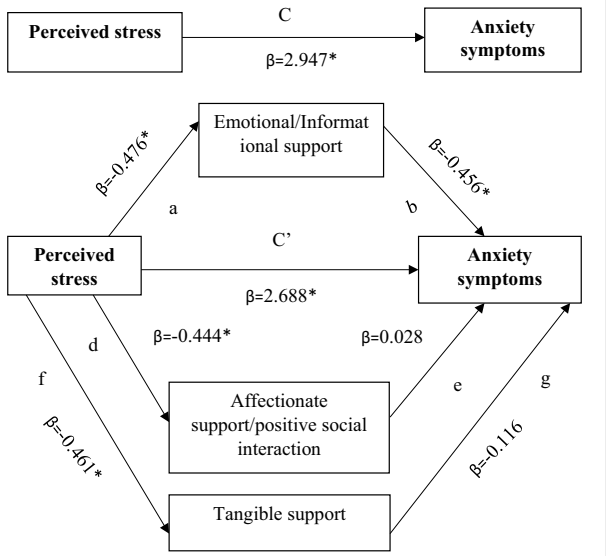

Fig. 3 Model of the mediating role of domains of social support between perceived stress and anxiety symptoms. **p < 0.01

found to be not statistically significant. The display of the parallel mediation model was presented in Fig. 3.

Discussion

This study aimed to examine the mediating effects of domains of social support in the relationship between stress and depressive and anxiety symptoms during pregnancy among Australian women, demonstrating a number of important findings. This study supplements limited evidence investigating the mediating role of domains of social support in the relationship between perceived stress and antenatal depressive and anxiety symptoms. In fact, this is the first study to examine the mediating effect of specific domains of social support in the linkage between perceived stress and antenatal depressive and antenatal anxiety symptoms among Australian women.

Our study shows that emotional/informational support has a significant partial mediational role in the relationship between stress and antenatal depressive and anxiety symptoms. Conversely, we also found that affectionate support/positive social interaction and tangible support have no significant mediation role in the link between stress and antenatal depressive and antenatal anxiety symptoms.

Two previous studies have assessed the mediational role of overall social support between stress and depressive symptoms [58, 59] as well as anxiety symptoms [58] among pregnant women. The first was a community-based study conducted among a sample of 755 pregnant Chinese women to investigate the roles of social support in assisting the stress coping ability of pregnant women with depressive and anxiety symptoms. The study found that subjective, objective and total social support each plays a significant direct effect on prenatal depression. Besides, this study indicated that social support has a mediating effect in improving prenatal depression and anxiety [58]. The other study conducted in Gondar, Ethiopia (n = 916), have shown that partner and social support partially mediated the association between stressors and antenatal depression [59]. In Australia, an organization known as PANDA (Perinatal Anxiety and Depression Australia) has offered nationwide telephone-based helpline support provided by counsellors for pregnant women, and their families experiencing mental health problems which played a significant role for women to recover from perinatal mental illness (http://www.panda.org.au). There is mixed evidence on the effectiveness of telephone support. A randomized control trial (RCT) conducted on assessing the effectiveness of a telephone support program for pregnant women in New Zealand found the intervention group at 34 weeks of gestation reported less stress, anxiety and depression levels compared to the control group [60]. Another RCT conducted in England among low risk nulliparous pregnant women indicated that telephone support by a midwife did not significantly reduce anxiety [61]. Further, a RCT conducted in Canada also found telephone support played an effective role in reducing postnatal depression [62]. In contrast, a RCT conducted in the US among pregnant women with a history of at least one spontaneous perinatal loss found that home visits by nurses did not significantly decrease anxiety levels [63].

Several mechanisms might explain our study's identified mediational role of emotional/informational support in the linkage between perceived stress and depressive and anxiety symptoms during pregnancy. The first mechanism is the stress-buffering hypothesis, which suggests that social support directly contributed to the well-being of individuals by enhancing positive affect and/or perceived self-worth of individuals and indirectly improve well-being by alleviating stressful conditions [26]. Second, the linkage between stress, emotional support and depressive or anxiety symptoms during pregnancy can be supported by the psycho-neuroimmunology framework [27], which suggests that the roles of emotional/informational support can change negative responses related to stress, which can help individuals to improve their problem-solving skill and develop a positive view about themselves. This, in turn, can reduce the negative effect stress has on their psychological well-being and reduce the risk of depressive and/or anxiety symptoms [28, 29]. Social support gives pregnant women a better individual well-being [64] and those with a better psychosocial support tend to cope better with stressful events [23]. A strong

sense of support can later give women the confidence to cope with stressful events without the help of their social network. Social support also has a significant effect on pregnant women's ability to identify possible stressors [65].

Our study found that affectionate support/positive social interaction and tangible support have no significant mediation role in the linkage between perceived stress and antenatal depressive and anxiety symptoms. These findings did not support our hypothesis that affectionate support/positive social interaction and tangible support plays a significant mediational role in the linkage between perceived stress and antenatal depressive and antenatal anxiety symptoms. One possible reason for this finding is that affectionate/positive social interaction and tangible support were measured using the MOS-SSS-19 scale, which mainly explores the perception of social support and not always reflects the actual available support in which sometimes the actual social support might not be perceived [66]. Further, the social support finding relies on self-reported data from study participants, which are potentially prone to recall bias. As a result of the above factors, the effects of the mediator variable (affectionate/positive social interaction and tangible support) will be underestimated and this might result in limited power of our analysis and false identification of a non-significant association.

Some other limitations need to be considered when making inferences from our study findings. First, the study depends on self-reported data from study participants, which has the potential to introduce recall bias. Second, our findings are limited to pregnant women within the age range of 34–39 years and as such, any interpretation of our findings with regards to other demographics and populations (including younger pregnant women) must be undertaken with caution. Studies have shown that there is variation in the level of prenatal social support across teen (15–19 years) and adult mothers (greater than 20 years) [67, 68]. The level of social support was reported to be less among teen mothers as they had less ability to make and sustain relationships with their social network [67, 68]. Despite these limitations, the significance of our study and findings is strengthened by the fact that our study provided the first analysis of data collected from a nationally representative sample of pregnant women within the age range of 34–39 years.

Conclusion

Our study demonstrated that emotional/informational support has a partial mediating role in the relationship between perceived stress and antenatal depressive and anxiety symptoms. Our study finding suggests that emotional/informational support can play a role in helping reduce the effects of stress, which in turn can reduce the risk of depressive and/or anxiety symptoms during pregnancy. The social support provided over the course of pregnancy may change [69] and in response, there is much to be gained from conducting a longitudinal study to explore the causative relationship between social support, perceived stress, and depressive and/or anxiety symptoms over the different time periods of pregnancy. As part of routine antenatal care activity, it may be beneficial to integrate valid tools to assess for the amount and type of social support received when recording the medical history of pregnant women. In order to further protect pregnant women from the effects of stress, policymakers and maternal health professionals are advised to develop community-based social support programs to enhance prenatal psychosocial support. Such programs should also work to strengthen the social network of pregnant women and ensure pregnant women have adequate emotional/information support.

Abbreviations

ALSWH: Australian Longitudinal Study on Women's Health; CESD-10: 10 Item Center for Epidemiological Study Depression scale; CI: Confidence Interval; GADS: Goldberg Anxiety Depression Scale; LMICs: Low and Middle-Income Countries; LOT-R: Life Orientation Test-Revised; MOS-SSS-19: 19 Item Medical Outcome Study Social Support Scale; SD: Standard Deviation; SPSS: Statistical Package for Social Science; VIF: Variance Inflation Factor; WHO: World Health Organization.

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Authors' contributions

AB and DS conceived the study, planned the study design and performed the analyses. AB performed the report write-up and drafted the manuscript. DS, JA & WP contributed to the analysis, reviewing draft document and manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

After request, all analyzed data will be available from the Australian Longitudinal Study on Women's Health (ALSWH). https://www.alswh.org.au/.

Declarations

Ethics approval and consent to participate

The ALSWH has been granted ethics clearance by the human research Ethics committee of the University of Newcastle (#H-076-0795) and the University of Queensland (#2004000224). Study participants were involved voluntarily and provided written informed consent. The confidentiality of study participants' information is firmly monitored by ALSWH staff. Approval letter for the current

study was obtained from the Human Research Ethics Committee of the University of Technology Sydney (ETH20-5306).

Consent for publication
Not applicable.

Competing interests
The authors declare they have no competing interests.

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