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Manathungei Nirmala Priyadarshanie ,[1] Dulshika A Waas ,[2] Sampatha Goonewardena ,[3,4] Aindralal Balasuriya ,[5] Chamara V Senaratna ,[4,6] Sharaine Fernando [7]

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CVS and SF are joint senior authors.

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For numbered affiliations see end of article.

Correspondence to
Dr Manathungei Nirmala Priyadarshanie; nirmalap@kdu.ac.lk

ABSTRACT

Objectives We aimed to determine the prevalence and factors affecting antenatal anxiety (AA) among Sri Lankan women.

Design We conducted a cross-sectional analysis of first trimester data from a population-based cohort of antenatal women.

Setting Field antenatal clinics of four field health areas in Colombo District, Sri Lanka.

Participants Antenatal women (n=535) in the first trimester of pregnancy and aged ≥18 years were sequentially recruited when they attended antenatal clinics selected using random cluster sampling. Those with hearing difficulty, visual and speaking problems or currently on treatment for mental disorders were excluded.

Measures We used an interviewer-administered questionnaire to collect data. The AA was identified using the validated Sinhala version of Perinatal Anxiety Screening Scale (PASS-S). Self-reported demographic and pregnancy-related information were verified against health records. Psychosocial risk factors were self-reported. We investigated the associations between potential risk factors and AA using regression models that included confounders identified through a directed acyclic graph and reported using adjusted odds ratios (ORs) with 95% confidence intervals (CIs).

Results The prevalence of AA during the first trimester of pregnancy, identified using a PASS threshold of ≥20, was 34.4% (n=184). We found several novel risk factors for AA, namely, physical (OR 2.1; 95% CI 1.4 to 3.2) and mental health problems of self (OR 2.3; 95% CI 1.2 to 4.4), physical (OR 2.1; 95% CI 1.4 to 3.4) and mental health problems of parents/spouse (OR 6.7; 95% CI 2.8 to 16.2), traumatic life situations (OR 2.7; 95% CI 1.5 to 4.8), substance abuse by the spouse (OR 3.5; 95% CI 1.9 to 6.6) and the spouse being away (OR 2.0; 95% CI 1.1 to 3.7). The other risk factors that we identified included domestic violence among family members (OR 6.4; 95% CI 1.3 to 31.0), loss of family support (OR 2.2; 95% CI 1.0 to 5.2), financial hardships (OR 1.7; 95% CI 1.0 to 2.8), accommodation-related issues (OR 2.2; 95% CI 1.0 to 4.9), unplanned pregnancy (OR 3.7; 95% CI 1.9 to 7.3), difficulties due to pregnancy (OR 2.0; 95% CI 1.1 to 3.4), changed or stopped education (OR 2.9; 95% CI 1.7 to 5.1), recent loss of employment (OR 2.9; 95% CI 1.2 to 7.0), recent death of a loved one (OR 3.5; 95% CI 2.0 to 5.9) and sleep problems during pregnancy (OR 1.6; 95% CI 1.1 to 2.3).

Conclusions The prevalence of antenatal anxiety is high in Sri Lanka and is associated with several risk factors, not previously described, which are potentially modifiable.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The main strengths were using data from a population-based cohort with no refusal to participate, and using a valid and reliable Perinatal Anxiety Screening Scale to identify AA.
⇒ Most self-reported information was validated using routinely collected health data.
⇒ The main limitation is the inability to establish causal associations, given the cross-sectional nature of the analysis.
⇒ The urban/semiurban nature of this cohort may limit the generalisability of the findings to the rural populations.

INTRODUCTION

Background

Anxiety is a psychological response to a threat.[1 2] It presents in multiple forms and affects emotional, cognitive, physical, behavioural and relational states. It includes feelings of uneasiness, worry, fear, apprehension, nervousness and distress and also longing, aching and yearning.[3] Compared with the general population,[4 5] anxiety symptoms are more common in antenatal and postpartum women,[6] likely due to pregnancy-related physiological and psychosocial changes leading to new onset of anxiety or worsening of pre-existing anxiety. Anxiety during pregnancy may be general (ie, unrelated to the pregnancy) or pregnancy-specific. The latter refers to anxiety arising from anticipated uncertainties related to pregnancy-specific issues during antenatal and/or postpartum periods, such as the well-being of the baby, hospital admission

and other related experiences during childbirth, the postpartum period and parenting and/or maternal role.[7]

The factors affecting antenatal anxiety (AA) are not comprehensively understood.[8] There is evidence that younger age, prolonged nulliparity and previous pregnancy losses could be associated with worsening of pre-existing anxiety during pregnancy.[9] In addition, several sociodemographic factors including low household income and low education level, poor social and family network, work-related stressors and strains, type of occupation and type of residence have been reported as potential risk factors for AA.[10 11] Other known risk factors with limited evidence include frequent changes in residence, past and present experiences of violence, poor spousal emotional support,[12 13] sleep disturbances and short sleep duration.[14] However, any association of personal and family health problems, pregnancy-related issues, or marital or other relationship-related issues with AA have not been investigated. Furthermore, the risk factors for AA can be shaped by sociocultural and sociodemographic factors[15] and therefore, the Sri Lankan women, among whom we conducted our study, may have unique risk factors. Characteristics of the Sri Lankan women are a mixture of those seen in women of developed countries and those of developing countries. In developed countries, women are often more independent and share the household and family chores with their husbands/partners or family members.[16] Their educational achievements are higher and they often pursue lifelong careers.[17] On the contrary, in developing countries, women often have poor literacy[18] and underpaid employment.[19] Poverty and traditions in developing countries drive extended families to live in one household that makes it difficult for antenatal women to change their lives positively.[17] Some characteristics of Sri Lankan women are similar to the women in developed countries, such as having a high literacy rate (>90%), opportunities to pursue lifelong careers and access to top career positions,[20] and relatively better social opportunities[21] compared with women in other low- and lower-middle-income countries. However, the responsibility of household chores, including cooking, washing, caring for children and elderly in the family, and hospitality towards family and friends is very often on the woman. In addition, Sri Lankan women are also subjected to discrimination, gender-based violence and the consequences of alcohol and drug addiction among family members.[21] It is in this unique background of sociocultural characteristics of Sri Lankan women that the factors associated with AA were investigated.

OBJECTIVE

We conducted this study to determine the prevalence of AA and risk factors for AA among Sri Lankan women.

METHODS

Design

We described previously the process of setting up and the baseline data of the population-based cohort of antenatal women[22] within which we conducted our study. In short, we recruited 535 antenatal women aged ≥18 years and in their first trimester of pregnancy from population-based field antenatal clinics of four suburbs in Colombo District (the capital district of Sri Lanka) using a random cluster sampling. Given the near-universal field clinic attendance and the sampling method used, the women in this cohort well represented the urban and semiurban antenatal women in the capital district of Sri Lanka.[22] We excluded those with hearing difficulty and visual or speaking problems or currently on treatment for mental disorders.

Patient and public involvement

Patients and/or public were not involved in the design of the study.

Data collection

We used an interviewer-administered questionnaire to collect the baseline data. This questionnaire included the Sinhala (the native language of Sri Lanka) version of the Perinatal Anxiety Screening Scale (PASS-S) that was previously validated.[23] AA was determined at the PASS-S cut-off of ≥20. The sociodemographic and other risk factor information was collected using validated questions. We adapted the questions on risk factors from the Social Circumstances Checklist developed by Somerville *et al*.[24] This study was conducted over a period of 19 months, from July 2018 to January 2020. All data were collected at the respective field antenatal clinics that provided sufficient facilities to protect women's privacy and confidentiality of data. All clinics, and therefore the interviews, were held in the morning hours, and each interview took 15–30 min. The information provided by the women was verified by cross-checking with antenatal health records maintained at the field health clinics by the principal investigator.

This study was conducted in accordance with the amended Declaration of Helsinki and was approved by the Ethics Review Committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka (ERC ref. No: 25/27, May 2017). All women provided informed written consent.

Statistical analysis

We reported the descriptive data using numbers and proportions and/or means and standard deviations (SDs). We investigated the associations between potential risk factors and AA using logistic regression models and used a directed acyclic graph to determine the minimum sufficient set of confounders for each model. We reported these associations as adjusted OR with 95% CIs. SPSS V.23[25] was used for data analysis.

RESULTS

The mean (±SD) age of the antenatal women was 29 (±5.8) years. Over half of the women (50.8%) were primiparous. The other basic characteristics of the antenatal women are given in table 1.

The mean (±SD) PASS-S score of the cohort was 14.0 (±9.5). The prevalence of AA (PASS-S score≥20) was 34.4% (n=184), and the mean (±SD) PASS-S scores in those with and without AA were 22.9 (±10.5) and 10.6 (±5.2), respectively.

Demographic and socioeconomic factors associated with AA

Housewives had higher odds of AA (OR 1.4; 95% CI 1.0 to 2.1; table 2). Older women and those with higher monthly income also had higher but statistically not significant odds of AA (OR 1.5; 95% CI 1.0 to 2.3 and OR 1.2; 95% CI 0.8 to 1.8), respectively. However, the levels of education or skills, or the number of previous pregnancies or living children were not associated with AA.

Selection of confounders to include in the regression models (minimum sufficient set of confounders for each model was selected using directed acyclic graphs) is given in table 3.

Psychosocial risk factors for AA

All the psychosocial factors that we investigated except family support (OR 2.2 95% CI 1.0 to 5.2) were associated with AA (table 4). The effect of being legally separated from the spouse or divorced on AA could not be calculated in the adjusted model due to the insufficient number of events.

DISCUSSION

Using the baseline data from a population-based cohort of Sri Lankan antenatal women, we found that over one-third of urban/semiurban women in Sri Lanka have AA. We also found several novel risk factors for AA, namely, physical and mental health problems in parents/spouse, facing traumatic life events (accidents/ injuries), recent death of a loved one, substance abuse by the spouse and the spouse being away.

The prevalence of AA during the first trimesters of the pregnancy that we detected (34.4 %) is much higher than what was reported in other countries. A direct comparison of the above results and previously reported prevalence is difficult because no previous study has reported AA in the first trimester of pregnancy using PASS. Priyambada *et al* in a study conducted in India using the Hospital Anxiety and Depression Scale (HADS) reported that the prevalence of AA in the first trimester to be 27.8%.[26] Dennis *et al* in their meta-analysis reported the pooled prevalence of anxiety symptoms during the first trimester of pregnancy to be 18.2%. The studies included in this synthesis used either the clinical diagnosis of a psychiatrist to detect anxiety or various screening tools, namely, HADS, HADS-Anxiety subscale (HADS-A), Pregnancy-Related Anxieties Questionnaire-Revised, State-Trait Anxiety Inventory

Table 1 Basic characteristics of the antenatal women (n=535)

Characteristic	Frequency (n)	Percentage (%)
Age (years)		
18–23	43	8.0
24–29	174	32.5
30–35	207	38.7
36–41	101	18.9
42–47	10	1.9
Ethnicity		
Sinhala	518	96.8
Tamil	12	2.2
Other (Moor/Burgher)	5	0.9
Religion		
Buddhist	505	94.4
Hindu	12	2.2
Christian	15	2.8
Islam	3	0.6
Level of education		
No schooling	3	0.6
Primary	210	39.3
Secondary	249	46.5
Tertiary	73	13.6
Occupation		
Professional, technical, administrative or managerial	128	23.9
Clerical or related	87	16.3
Agriculture, fisheries or other elementary	19	3.6
Unemployed or housewives	301	56.3
Average monthly family income (LKR)*		
0–50000	221	41.4
50 001–100 000	225	42.0
100 001 or more	89	16.6
Gravidity		
Primigravida	272	50.8
Multigravida	263	49.2
Number of living children (n=263)		
One child	168	63.9
Two children	60	22.8
Three or more children	35	13.3
Previous pregnancy losses		
History of miscarriages (out of 263)	91	34.6
History of stillbirths (out of 263)	3	1.1

*Median household income in Sri Lanka is LKR 76 414.[33]
LKR, Sri Lankan rupees.

Table 2 Association of demographic and socioeconomic factors with antenatal anxiety (n=535) after selecting confounders to include in the regression models (minimum sufficient set of confounders for each model was selected using directed acyclic graphs)

Risk factor	Antenatal anxiety present (n=184)	Antenatal anxiety absent (n=351)	Unadjusted OR (95% CI)	P value	Adjusted * OR (95% CI)	P value
Age of woman						
≤35 years	138 (75.0)	286 (81.5)	1.5 (1.0 to 2.3)	0.051	1.5 (1.0 to 2.3)†	0.051
>35 years	46 (25.0)	65 (18.5)				
Education level of the woman						
Up to primary	104 (56.5)	133 (37.9)	0.8 (0.6 to 1.1)	0.123	0.8 (0.6 to 1.1)†	0.123
Secondary or above	80 (43.5)	218 (52.1)				
Education level of the spouse						
Up to primary	101 (54.9)	137 (39)	0.8 (0.5 to 1.1)	0.103	0.8 (0.5 to 1.1)†	0.103
Secondary and above	83 (45.1)	214 (51)				
Occupation of the woman						
Employed	71 (38.6)	163 (46.4)	1.4 (1.0 to 1.9)	0.049	1.4 (1.0 to 2.1)	0.060
Unemployed	113 (61.4)	188 (54.6)				
Monthly family income (LKR)‡						
≥76 414	58 (31.5)	135 (38.5)	1.4 (1.0 to 2.0)	0.067	1.2 (0.8 to 1.8)	0.410
<76 414	126 (68.5)	216 (61.5)				
Number of pregnancies						
First pregnancy	92 (50.0)	180 (51.3)	1.1 (0.7 to 1.5)	0.424	1.0 (0.7 to 1.5)	0.934
More than one pregnancy	92 (50.0)	171 (48.7)				

*Factors adjusted are shown in table 3.
†No adjustment was required for the causal diagram model.
‡Median household income in Sri Lanka is LKR 76 414.[33]
LKR, Sri Lankan rupees.

(STAI) or.[27] Jha *et al* in a review reported that the prevalence of AA in the lower-middle-income countries varies from 1% to 26% when STAI, Hamilton anxiety scale or HADS[28] was used, while AA during the first trimester of pregnancy in Australia detected with HADS-A was reported to be 15.2%.[29] In Italy, the AA during the first trimester of pregnancy detected with STAI and clinical interviews was reported to be 24.3%.[30] These various questionnaires use different questions and scale thresholds to detect AA, which may potentially contribute to the variation of prevalence reported. The higher prevalence in our cohort could be due to Sri Lankan women facing more stressors than women in developed countries but it is unclear why it is relatively higher than that in other low-middle-income countries. It is likely, however, that the sociocultural factors that differentially affect participants from different cultural and geographical areas also have contributed to cause AA within our cohort. Globally, anxiety during the third trimester is found to be higher than in the other trimesters.[31] This high prevalence is a concern, given the adverse pregnancy outcomes that result from untreated AA.[32]

Unemployment of the women was independently associated with AA and so was the level of income although not statistically significant. Majority of women (n=68.5%) with AA had an average household monthly income of less than the national median income (Sri Lankan rupees;LKR 76,414).[33] Lower monthly income is thought to be a general cause of anxiety in developed countries due to growing financial needs of feeding and educating the children,[34 35] which can be aggravated by additional economic commitments expected with the pregnancy and childbirth. Our finding that stopping education[36] and loss of employment[37] are associated with AA adds to

Table 3 Selection of confounders to include in the regression models (minimum sufficient set of confounders for each model was selected using directed acyclic graphs)

Exposure variable in the model	Confounders
Traumatic life situations	None
Physical health problems of mother/ father/spouse (M/F/S)	Occupation (spouse) and substance abuse by spouse
Financial hardships	Change in employment, education (woman), family income, legal issues, traumatic life situations, loss of employment, occupation (spouse), occupation (woman), physical health problems (self), separation or divorce, substance abuse by spouse and unplanned pregnancy
Mental health problems of mother/ father/spouse (M/F/S)	Age, education (woman), occupation (spouse), occupation (woman) and substance abuse by spouse
Physical health problems (self)	Age, traumatic life situations and occupation (woman)
Loss of family support	Death of a loved one, domestic violence targeting others, loss of employment, mental health problems M/F/S, partner being away, physical health problems M/F/S, relationship difficulties (others), relationship difficulties with spouse, separation or divorce, substance abuse—self and unplanned pregnancy
Accommodation-related issues	Financial hardships
Death of a loved one	None
Domestic violence targeting others	Substance abuse by spouse
Difficulties due to pregnancy	Age, fatigue, traumatic life situations, loss of family support, number of pregnancies and physical health problems (self)
Unplanned pregnancy	Substance abuse by partner and education (woman)
Legal issues	Domestic violence targeting others and substance abuse—Self
Changes/ stopped education	Education (woman), financial hardships, life events and physical Health problems M/F/S
Loss of employment	Traumatic life situations, physical health problems M/F/S, physical health problems (self) and occupation (woman)
Mental health problems of self	Accommodation-related issues, change in employment, death of a loved one, difficulties due to pregnancy, domestic violence, financial hardships, legal issues, traumatic life situations, loss of employment, mental health problems M/F/S, occupation-related stressors, partner being away, physical health problems (self), relationship difficulties (others), relationship difficulties with spouse, separation or divorce, sleeping problems, substance abuse—self, substance abuse by spouse and unplanned pregnancy
Spouse being away	Occupation (spouse)
Separation or divorce	Accommodation-related issues, change in employment, death of a loved one, difficulties due to pregnancy, financial hardships, legal issues, traumatic life situations, loss of employment, mental health problems M/F/S, mental health problems of self, occupation-related stressors, partner being away, physical health problems M/F/S, physical health problems (self), poor family support, relationship difficulties (others), relationship difficulties with spouse, substance abuse—self and substance abuse by spouse
Substance abuse by spouse	None
Substance misuse (self)	None
Sleeping problems	Financial hardships, mental health problems of self, occupation-related stressors and substance abuse—self
Education (woman)	None
Occupation (woman)	Occupation (woman)
Education (spouse)	None
Occupation (spouse)	Education (spouse)
Age	None
Number of pregnancies	Education (spouse) and education (woman)
Family income	Change in employment, loss of employment, occupation (spouse) and occupation (woman)

Table 4 Association of psychosocial risk factors with antenatal anxiety (n=535)

*Risk factor	Antenatal anxiety present (n=184)	Antenatal anxiety absent (n=351)	Unadjusted OR (95% CI)	P value	Adjusted† OR (95% CI)	P value
Physical health problems of mother/ father/spouse	54 (52.4)	49 (47.6)	2.6 (1.65 to 3.9)	0.000	2.1 (1.4 to 3.4)	0.001
Financial hardships	55 (50.0)	55 (50.0)	2.3 (1.5 to 3.5)	0.000	1.7 (1.0 to 2.8)	0.033
Mental health problems of mother/ father/spouse	27 (79.4)	7 (20.6)	8.5 (3.6 to 19.8)	0.000	6.7 (2.8 to 16.2)	0.000
Loss of family support	17 (42.5)	23 (57.5)	2.6 (1.2 to 5.6)	0.009	2.2 (1.0 to 5.2)	0.057
Accommodation-related issues	16 (57.1)	12 (42.9)	2.7 (1.2 to 5.8)	0.010	2.2 (1.0 to 4.9)	0.046
Death of a loved one	40 (60.6)	26 (39.4)	3.5 (2.0 to 5.9)	0.000	‡3.5 (2.0 to 5.9)	0.000
Traumatic life events (accidents/ injuries)	29 (55.8)	23 (44.2)	2.7 (1.5 to 4.8)	0.001	‡2.7 (1.5 to 4.8)	0.001
Domestic violence targeting family members	10 (83.3)	2 (16.7)	10.0 (2.2 to 46.3)	0.001	6.4 (1.3 to 31.0)	0.021
Difficulties due to pregnancy	39 (53.4)	34 (46.6)	2.5 (1.5 to 4.1)	0.000	2.0 (1.1 to 3.4)	0.016
Unplanned pregnancy	27 (65.9)	14 (34.1)	8.5 (3.6 to 19.8)	0.000	3.7 (1.9 to 7.4)	0.000
Physical health problems of self	61 (48.4)	65 (51.6)	2.2 (1.5 to 3.3)	0.000	2.1 (1.4 to 3.2)	0.000
Changes/stopped education	44 (63.8)	25 (36.2)	4.1 (2.4 to 6.9)	0.000	2.9 (1.7 to 5.1)	0.000
Loss of employment	15 (62.5)	9 (37.5)	3.4 (1.5 to 7.9)	0.004	2.9 (1.2 to 7.0)	0.017
Mental health problems of self	44 (63.8)	25 (36.2)	4.1 (2.4 to 6.9)	0.000	2.3 (1.2 to 4.4)	0.013
Spouse being away	23 (50.0)	23 (50.0)	2.0 (1.1 to 3.7)	0.017	2.0 (1.1 to 3.7)	0.023
Separation or divorce	2 (100)	–	1.0 (0.9 to 1.0)	118	§-	§-
Substance abuse by spouse	28 (62.2)	17 (37.8)	3.5 (1.9 to 6.6)	0.000	‡3.5 (1.9 to 6.6)	0.000
Sleeping problems	83 (61.0)	53 (39.0)	1.8 (1.2 to 2.6)	0.001	1.6 (1.1 to 2.3)	0.022

No woman reported domestic violence against self
*Risk factors were adapted from Social Circumstances Checklist (24).
†Factors adjusted are shown in table 3.
‡No adjustment was required as the causal diagram model.
§Value cannot be calculated due to the insufficient events.

the existing evidence. Continuing employment may give a perceived sense of stability to the woman, especially with the addition of a new member to the family, whereas discontinuation of employment could lead to additional financial burdens to the family as well.[35] Ceasing education may negatively affect the existing social networks of the women,[27] which could, at least partially, explain our findings.

The associations of mental and physical health problems in parents/spouse with AA that we found are novel. Many Sri Lankan women continue to maintain close ties with the parents even after marriage and depend on them for childrearing. The perceived loss of this support due to parental ill health and the need to take care of parents during the pregnancy could potentially lead to or worsen AA. This is also supported by the association that we have found between loss of family support during pregnancy and AA, which is similar to the previous reports.[35 38 39] The odds of AA due to mental health problems of an immediate family member (mother/father/spouse) were much higher than that due to mental health problems of the women themselves. This could be due to several reasons. First, the exclusion of women who are receiving treatment for mental health problems during

recruitment would have influenced this association we detected. Second, the mental health problems of both self and family members were self-reported by women, which could have led to misclassification of mental health status in both groups. Self-awareness of mental health problems in women could be low.[40] In contrast, the perception of mental health problems in family members could be higher and potentially linked to anxiety due to the perceived loss of social and other support associated with that as seen in previous studies.[41 42] According to the cultural influences in Sri Lanka, the pregnant woman is cared for mainly by her spouse during the initial period of pregnancy and by her own parents closer to delivery. Any perceived or actual disruption to this support network due to any mental health problem in the spouse or parents will directly affect AA of the pregnant woman. Conversely, such social support has been previously reported in Sri Lanka to enhance the mental well-being of pregnant women'.[43]

The associations that we found between noteworthy life events such as facing traumatic situations like accidents or injuries or death of a loved one and AA were also novel. Trauma creates a threat to a person's life and changes emotional integrity. People who experience trauma have a high tendency of getting anxiety in a variety of forms including generalised worry or panic attacks.[44] In addition, maladaptive coping with recent stressors also contributes to anxiety.[45]

Of the pregnancy-related factors associated with AA, unplanned pregnancy had the highest risk, similar to what has been previously reported.[11 39] Women who have an unplanned pregnancy are usually not mentally prepared to go through the physical, mental and psychosocial changes of pregnancy, and therefore, the anticipated new responsibilities during the pregnancy and the postnatal period to be dealt with could be the underlying reasons for anxiety.[46]

The association between accommodation-related issues and AA that we found confirms previous reports.[13] All women who reported such issues in our cohort lived in rented properties that are small temporary houses with one or two living rooms (data not shown). Low-quality accommodation and insufficient living spaces are known to cause mental distress among those living in rented houses,[47] which may be a key driver for the observed association in our study. The other risk factors that we found for AA such as lack of family support, unplanned pregnancy and domestic violence among family members also confirm previous findings from the Asian region.[34 48 49] None of the women reported domestic violence against self, which is surprising to give the high prevalence of domestic violence in Sri Lanka.[50] This is potentially due to the social stigma attached to it. Due to this reason, we could not find any association between this factor and AA although such association was reported previously[51] Most Asian cultures have similar family matrices that are important support structures for pregnant women, and the observed associations highlight their importance for the mental well-being of the Asian antenatal women.[28]

Substance abuse by the spouse[52] and the spouse being away[53] are other new risk factors that we found. Both these potentially lead to a poor relationship with the intimate partner, which is a known risk factor for AA.[6 10 34]Only two women in our cohort were separated/divorced, and they both had AA, highlighting the importance of the role of partner/spouse for the mental health of antenatal women.

We found that sleep-related problems during pregnancy were associated with AA, which adds to the existing evidence.[54] The antenatal sleep problems are most likely due to physical changes and family stressors during pregnancy.[55 56] It is important to address the barriers to good-quality sleep during pregnancy in the attempts to reduce the occurrence of AA.[57]

Our study has both strengths and limitations. The population-based nature of the cohort and zero refusal rate[22] enabled us to estimate the true population prevalence of AA and its risk factors. The use of previously validated PASS-S[23] and other validated questions as data collection tools increased the validity of our findings. We also confirmed most self-reported health information using routinely collected health data by reliable field healthcare workers, thereby minimising the information biases.

One limitation of this study is collecting information on both the potential risk factors and AA at the same time, which precludes making causal inferences. To determine the associations, we used multiple regression models chosen using directed acyclic graphs, which prevented any over-adjustment but might have increased the probability of detecting spurious associations. The women in the cohort came from an urban/semiurban population, so generalisation of our findings to the rural populations must be done with caution.

CONCLUSION

The prevalence of AA is high in Sri Lanka and is associated with the novel risk factors of physical and mental health problems in the antenatal woman and her parents/spouse, facing a traumatic life situation (accidents/injuries/recent death of a loved one), substance abuse by the spouse and the spouse being away, in addition to other previously known risk factors. Several risk factors identified in this study are detectable prior to pregnancy or during routine antenatal clinic visits, and many of them are potentially modifiable. These, together with the current evidence for adverse pregnancy outcomes of AA, indicate that there may be a place for potential preventative interventions to minimise the burden of AA.

The CROSS checklist of this study is located in online supplemental file 1.

Author affiliations
[1]Department of Nursing & Midwifery, General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka
[2]Department of Psychiatry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[3]Department of Community Medicine,Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[4]Non-Communicable Diseases Research Centre, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
[5]Department of Public Health, Faculty of Medicine, General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka
[6]Allergy and Lung Health Unit, Melbourne School of Population and Global Health, The University of Melbourne, Melbourne, Victoria, Australia
[7]Department of Physiology, Faculty of Medical Sciences,University of Sri Jayewardenepura, Nugegoda, Sri Lanka

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ORCID iDs
Manathungei Nirmala Priyadarshanie http://orcid.org/0000-0002-5226-1443
Dulshika A Waas http://orcid.org/0000-0002-3214-2674
Sampatha Goonewardena http://orcid.org/0000-0002-3368-7959
Aindralal Balasuriya http://orcid.org/0000-0001-5150-1292
Chamara V Senaratna http://orcid.org/0000-0002-5879-6174
Sharaine Fernando http://orcid.org/0000-0002-6586-1034

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