A mix methods evaluation of the effectiveness of a group-based prenatal yoga programme on perceived stress in pregnant women

Zehra Baykal Akmese (✉️ zehra.baykal@ege.edu.tr)
Ege Universitesi  https://orcid.org/0000-0002-4753-2421

Sezer Er Güneri
Ege Universitesi

Research article

**Keywords:** Yoga, Pregnancy, Pregnant women, General Adaptation Syndrome, Relaxation, Perceived Stress

**DOI:** https://doi.org/10.21203/rs.3.rs-48031/v1

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Abstract

Background

Yoga is recommended as a behavioural self-management strategy for stress. However, the evidence of how it affects women’s stress perception is not much studied. Hence the present study was taken to assess the perceived stress score and to explore the experiences of pregnant women of stress management before and after prenatal yoga programme according to Selye’s General Adaptation Syndrome Theory.

Methods

This study was made using concurrent triangulation mixed method design. Quantitative part of the study was made pretest-posttest with control group experimental study, qualitative part of the study was made phenomenological method. Quantitative data were gathered from 31 pregnant women in both yoga and control groups. As for qualitative data, 21 and 15 pregnant women were interviewed in the first and second interviews, respectively. Pregnant Woman Description Form was used as a data collection tool; a visual analogue scale was used for measuring stress score; and the interviews were made through Semi-Structured Interview Form. The themes were determined according to the stages of Selye’s General Adaptation Syndrome Theory. Thematic approach was used to assess the data.

Results

The difference among the first, second and third visual analogue scale stress perception mean scores of pregnant women in the prenatal yoga programme and control groups was statistically significant. The women mostly used the expressions relaxation, decrease in stress perception and learning to cope with stress to describe stress perception after prenatal yoga programme. All women told that their stress perception decreased, and they learned how to cope with stress in pregnancy.

Discussion

This study demonstrated yoga was acceptable to stressed pregnant women. There was a significant decrease in stress perception of pregnant women. The women had a chance to express the physical and mental effects of yoga on stress management.

Background

Stress perception is a common case during pregnancy [1]. It has been depicted that 36.1% of pregnant women encounter a stressful life event at least three times in the last year before birth [2]. Recently, the study of maternal prenatal stress and its impact on the developing fetus has received a great deal of
attention [3–6]. The evidence-based researches revealed that the stress perceived in the pregnancy led to prematurity, low birth weight, neonatal morbidity and mortality directly or indirectly. The stress perceived in the pregnancy may lead to unplanned cesarean, long term bed rest, increase of requirements for receiving health service, higher use of analgesia in the delivery, postpartum depression and increase of alcohol use and smoking [3–6]. Pregnant women should be evaluated in terms of psychosocial risk factors, and one dimension of the care given should be devoted to psychosocial stressors perceived by women [3]. It is important to evaluation of pregnant women in all dimensions, determination of relevant major risk factors, giving convenient current information with respect to problem, making suggestions and making all possible changes to look at stress-reduction techniques specifically designed for pregnant women. It has been demonstrated that in decreasing the stress perception of pregnant women, yoga is effective [2, 5–7]. This is because yoga is known to ensure physical, mental and spiritual well-being through concentration, physical standings poses, breathing exercise and deep relaxation [2, 5–7].

Many research studies have reported beneficial effects of yoga on the diseases [7–14]. The randomised controlled studies demonstrate that the yoga performed in the pregnancy period decreased perinatal anxiety [15–16], improved psychological health [17] and autonomic nerve system response to stress [6], took hypertension under control [18] and increased quality of life [18]. However, a limited number of studies have been conducted to evaluate how effective the yoga done to decrease the stress perceived in the pregnancy period and to increase the relaxation is [19]. Moreover, to reveal how effective the prenatal yoga programme on perceived stress is, this mixed method research has been designed. For the quantitative part of the research, we hypothesized that there is a significant decrease in stress perception after participation in prenatal yoga programme. As for the qualitative part conducted synchronously, the experiences of pregnant women have been revealed through interviews in a realistic and integrative way. The research question is, ‘How do pregnant women define stress perception before and after the yoga intervention based on Selye's General Adaptation Syndrome (GAS) theory?’

**Methods**

**Study Design**

This study was made using concurrent triangulation mixed method design conducted from December 2015 through June 2016. Pregnant women who came to pregnancy policlinic for routine antenatal care and reported stress perception scores were five and above according to Visual analogue scale (VAS) eligible to enroll.

The study was approved by the institutional ethics committee of Ege University Medical Faculty (Decree No. 15-10/3) in accordance with the Declaration of Helsinki Research Principles. All participating women provided informed consent before enrolling in the study. The women's names were not used due to ethical concerns, and they were coded as P1, P2 and so on.

**Study Subjects and Setting**
All women at the beginning of their second trimester were informed by researchers at the hospital clinic of the possibility of taking part in the study if they had a stress perception. The inclusion criteria were as follows: 1) women who came to pregnancy policlinic for examination 2) who were literate 3) in the age group between 19 and 35 years 4) on 12th–18th gestational week 5) stress perception scores were five and above based on Visual analogue scale (VAS), 6) no other pregnancy contraindication 7) no history of abortion or curettage 8) resident in the city of Izmir, Turkey. Through Informed Consent Form, written consent of the participants was received, and to determine their sociodemographic characteristics, Pregnant Women Description Form was applied. Following the application of research forms, the women were categorised randomly to the prenatal yoga programme group or control groups using a random number table. The women in the prenatal yoga programme group were informed about the starting date of yoga and the location of the training centre. The interviews were made in the training centre through Semi-Structured Interview Form (SSIF).

Using the Statistical and Power Analysis Size Software 2005 (NCSS-PASS) program, the power of research was calculated. The mean difference of VAS in the intervention group between the first and third measurements was found −7.12±1.97. The mean difference of VAS as for the control group between the first and third measurements was found 1.35±1.11 (α = 0.05). The power of research was calculated to be 100%, and the quantitative data collection process was finalised (n=31). Within the qualitative process, semi-structured interviews were made using the SSIF created following the direction of Selye's GAS theory and recorded by audio recording device. The voices of 21 women who gave their consent for sound recording before prenatal yoga programme and 15 women after prenatal yoga programme were digitally recorded and were transcribed verbatim.

**Assessment Tools**

A 3-part survey was used for data collection. The questionnaires included a pregnant woman description form, a visual analog scale for measuring stress score, and the Semi-Structured Interview Form.

*Pregnant Woman Description Form (PWDF)*

This form, an investigator developed survey, consisted of 26 questions in total to determine the sociodemographic and obstetric characteristics of pregnant women.

*Visual Analog Scale (VAS)*

This was preferred because it is a fast and simple scale for evaluating perceived stress. This helps the individual to define stress and express himself or herself without using long scales. The VAS rating system consists of a 100- mm line that represents pain along a continuum of 2 extremes, from no pain (a score of 0) to extreme pain (a score of 10). In addition, this eliminates the defects that may arise out of use of long scales in the cases in which communication is challenging due to the differences between the interviewer and the interviewee's educational background. It was determined that VAS was significantly effective as much as the other scales used for measuring stress perception [20].
Semi-Structured Interview Form (SSIF)

This form is based on Hans Selye's GAS Theory. With the aim of determining its functionality and the period of interview, pilot-interviews were made with five women using its first version created to ensure the validity and reliability of the form. The form was reviewed and put into final form following these interviews. In the first interview made before the yoga intervention to the accompaniment of Semi-Structured Interview Form, the longest sound recording took 22 minutes four seconds while the shortest sound recording took five minutes 27 seconds.

Data Collection

The quantitative and qualitative data were collected synchronously within the data collection process of the research as a requirement of the research pattern. The aim of this pattern is to explain a research problem by adding the qualitative data to research process by means of conducting an intervention program [21].

Through Informed Consent Form, written consent of the participants was received, and to determine their sociodemographic characteristics, Pregnant Women Description Form was applied. Following the application of research forms, the women were categorised randomly to the prenatal yoga programme group or control group.

The Prenatal Yoga Programme Group

The stress levels of pregnant women in the yoga intervention group (n=31) were measured with VAS at the first study visit and the pregnant women who were scored five and above and who fulfilled the research criteria, were included into group. The pregnant women were directed to pregnancy training center of relevant hospital for yoga program which was initiated within the same week. The pregnant woman who came at the data and time notified to her, was interviewed to the accompaniment of Semi-Structured Interview Form and first qualitative data set was collected and then, yoga practice was started. The pregnant women in the intervention group did yoga in the pregnancy training center for 60 minutes twice weekly throughout four weeks. In the second week of yoga intervention, the stress perceptions of pregnant women were measured with VAS. Immediately after the completion of four weeks yoga program, the stress perceptions of pregnant women in yoga intervention group (n=31) were measured with VAS and the interviews were made with the pregnant women who accepted to make interview (n=15) within the direction of Semi-Structured Interview Form and their experiences devoted to the effect of yoga on stress perception were determined. In the second interview consisting of four questions, the longest sound recording took five minutes 39 seconds while the shortest sound recording took two minutes one second.

Control Group

The stress perceptions of pregnant women in the control group (n=31) were measured by applying VAS at the first study visit, two week later and at the end of fourth week synchronously with the yoga intervention group.
**Intervention procedure**

At the beginning of yoga practice, the researcher requested the pregnant women to take a relaxed sitting position (block, mat or ball in the following gestational weeks), put their hands at on their legs in the way they would feel comfortable, close their eyes and focus on their bodies without holding on mental flow. With the verbal soothing directives given during the concentration phase which took approximately 3-5 minutes, it was aimed to focus the pregnant women to their bodies mentally and to increase the physical awareness. Only a breath awareness exercise was made following the concentration. The researcher constituted the standing pose part of yoga intervention from the standing poses that the pregnant women will do in the second and third trimester and it was practiced for approximately 30-40 minutes based on the flow of course. The standing poses applied in the research were practiced by doing physically and giving verbal directives by researcher in a controlled way and they were adapted according to feedbacks of pregnant women. The yoga exercise at which concentration, breathing and standing poses were applied respectively, was finally completed with a deep relaxation which took at least five minutes. During the deep relaxation, the attention was gathered on the body parts where the tension was felt, to relax each part of body respectively. The pose of lying the body forward on the ball or left-side lying supported with mat, was used as deep relaxation pose. Each yoga intervention took approximately 60 minutes.

**Data processing and Analysis**

The primary aim of this study was to compare 4-week changes in stress scores measured by the VAS in each group and between the 2 groups. A secondary aim was to determine the experiences of pregnant women have been revealed through interviews in a realistic and integrative way in prenatal yoga group.

In the quantitative data analyses, the Statistical Package for the Social Sciences (SPSS) 16.0 was used, whereas NCSS-PASS programmes were used to determine the power of research. On the other hand, Fisher's exact chi-square test, Wilcoxon-signed item value, Friedman's variance analysis and Mann–Whitney's U test were conducted in the comparative analyses [22]. The level of significance in all analyses was set at P less than .05.

Qualitative coding and analysis of themes followed a general inductive approach. NVIVO 11.0 plus statistical programme was used for coding, revealing the themes, numerical analyses of qualitative data and visualising the findings [22]. The SSIF of each pregnant woman was transferred to NVIVO 11.0 individually. Three specialists in the qualitative research read the transcripts iteratively and prepared a list of codes independently, and then they compared these lists, edited the codes and reached a consensus on the definitions of the codes. Specialists familiarised themselves with the raw data then discussed the conceptual framework of themes. Thematic analysis was conducted in context of stress perceptions, barriers and benefits of yoga participation. Themes were grouped for reporting and each theme was illustrated by direct quotations from participants.

**Results**
Quantitative Findings

The average age of pregnant women was 28.67 ± 4.12 and 27.80 ± 4.68 in the intervention and control groups, respectively. The average age at marriage was 25.70 ± 3.81 years in the intervention group and 22.29 ± 4.06 years in the control group; 48.4% of the women in the intervention group were higher education graduates, and 42.0% of the women in the control group were primary school graduates. In both groups, more than half of the women were born in metropolitans and have lived there for a long time. A statistically significant difference was found between VAS stress perception mean scores of the first and third measurements in the intervention group following the yoga programme ($\chi^2 = 61.512, p = 0.000$), which indicates a significant decrease in stress perception of pregnant women. A statistically significant difference was also found between the intervention and control groups after the completion of yoga programme, which points out a significant decrease in stress perception of the intervention group. The comparison of VAS stress perception mean scores of pregnant women in the prenatal yoga programme and control groups are summarised in Table 1 (Fig. 1). In brief, the quantitative data analysis shows that the prenatal yoga programme is effective in stress management.

| VAS     | PREGNANT GROUPS | z value | p value |
|---------|-----------------|---------|---------|
|         | Prenatal yoga programme group (n = 31) |         |         |
| Mean ± SD | Max.–Min. | Median | Mean ± SD | Max.–Min. | Median |
| VAS 1   | 7.74 ± 1.71 | 5.0–10.0 | 7.0 | 7.87 ± 1.72 | 5.0–10.0 | 8.0 | −0.410 | 0.682 |
| VAS 2   | 4.16 ± 1.46 | 1.0–8.0 | 4.0 | 8.35 ± 1.51 | 5.0–10.0 | 9.0 | −6.370 | 0.000 |
| VAS 3   | 0.61 ± 0.71 | 0.0–2.0 | 0.0 | 9.22 ± 1.17 | 6.0–10.0 | 10.0 | −6.949 | 0.000 |
| VAS Difference (VAS 3–VAS 1) | −7.12 ± 1.97 | −10.0–(−3.0) | −7.0 | 1.35 ± 1.11 | 0.0–3.0 | 2.0 | −6.812 | 0.000 |

Mann–Whitney U test, $p < 0.05$.

Qualitative data

Before the yoga programme, one main theme for the alarm stage, two for the resistance stage and two for the exhaustion stage were determined. The distribution of expressions that pregnant women used for defining their stress perceptions before prenatal yoga programme is shown in Table 2.
Table 2
Frequency of expressions before prenatal yoga programme based on the stages of Selye's stress theory

| Selye's GAS stages    | Main theme                          | Subtheme                        | Frequency |
|-----------------------|-------------------------------------|---------------------------------|-----------|
| **Alarm stage**       | Unable to accept pregnancy          | Perceiving stress               | 6         |
|                       |                                     | Feeling pain                    | 4         |
|                       |                                     | Being insensitive               | 4         |
|                       |                                     | Being afraid                    | 3         |
|                       |                                     | Not being able to be sure       | 3         |
|                       |                                     | Feeling empty                   | 3         |
|                       |                                     | Shaking oneself                 | 1         |
|                       |                                     | Being concerned                 | 1         |
|                       |                                     | Passing off                     | 1         |
|                       |                                     | Turning pale                    | 1         |
|                       |                                     | Breaking down                   | 1         |
| **Resistance stage**  | Not feeling physically/mentally ready for pregnancy | Not feeling physically ready | 6         |
|                       | Existence of situations unexperienced | Existence of feelings unexperienced | 3         |
|                       |                                     | Not believing in bearing a child | 2         |
|                       |                                     | Insufficient marriage satisfaction | 2         |
|                       |                                     | Increase in responsibility       | 2         |
|                       |                                     | Not feeling ready for maternity | 1         |
|                       |                                     | Desire to be a working mother    | 1         |
|                       |                                     | Not perceiving the pregnancy     | 1         |
|                       |                                     | Not visualising                  | 1         |
|                       |                                     | Concern about not being an effective mother | 1         |
|                       |                                     | Being unplanned                  | 1         |
|                       |                                     | Not being able to accept         | 1         |
| Selye's GAS stages        | Main theme                          | Subtheme              | Frequency |
|---------------------------|-------------------------------------|-----------------------|-----------|
| Exhaustion stage          | Feeling physically/mentally powerless | Not feeling energetic | 17        |
|                           |                                     | Tired                 | 6         |
|                           |                                     | Getting tired quickly | 5         |
|                           |                                     | Fat                   | 3         |
|                           |                                     | Unresistant            | 1         |
|                           |                                     | Painful               | 1         |
|                           |                                     | Weak                  | 1         |
|                           |                                     | Unhealthy             | 1         |
|                           |                                     | Lonely                | 1         |
|                           | Unable to cope with stress          | Awkward               | 3         |
|                           |                                     | Anxious               | 2         |
|                           |                                     | Depressed             | 1         |

In the alarm stage, the women were ‘unable to accept pregnancy’.

P12 expressed that ‘when I first learned about my pregnancy, nothing changed. You know you don’t feel anything, I couldn’t understand if my body was normal or not. It was even like missing my period ... If it (the baby) had arrived at a normal time [when she felt ready], I wouldn’t have had any problems, I would have accepted that’.

P19 stated that ‘I got pregnant, I thought a lot about what I should do if my kid was born. Whenever I thought about this, I had a pain in my belly ... I fear delivery a lot. I feel stressed. I think about all the possibilities. Would it be better if I weren’t pregnant?”

In the resistance stage, they were ‘not feeling physically/mentally ready for pregnancy’, and the ‘existence of situations unexperienced’ was obvious.

P13 made a statement that ‘it’s a big trouble for me. I mean I panic a lot. I exaggerate everything saying what am I gonna do, what am I gonna do in my brain. My pregnancy, too ... I can't help it. I mean it's like a tension. I think it would be better if I were slimmer. Now I think I will possibly have a problem because of this (my weight)’.

P20 made a statement as follows “… and I finished high school. I started work at the age of 19. It was a time for me to experience some good things. I only worked, I actively worked for 6 years. This is why I had unfulfilled desires, I think. Pregnancy came into my life like a light. I thought I would get used to it. I know as the time goes by, I will make the things I couldn't experience too much. It's like an irreversible journey.’
In the exhaustion stage, they were ‘feeling physically/mentally powerless’ and ‘unable to cope with stress’.

P1 expressed that ‘Actually I realised I can't deal with that, I gave up. I wish I could have dealt with that. I tried hard. I tried to get better, but I think I couldn't … It (stress) was able to capture me’.

P3 said, ‘I do nothing. I get stressed and I can't get rid of that’.

P15 stated, ‘actually I do nothing … I mean I do nothing to cope with this physically. I mean I'm not that energetic. In fact I know I don't have any health problems, but I feel powerless because of pregnancy. I feel that. It's about pregnancy, I know. Sometimes I feel exhausted ... I feel overwhelmed’.

After the yoga programme, three main themes were determined: ‘relaxation’, ‘decrease in stress perception’ and ‘learning to cope with stress’. All women expressed that their stress perception decreased, and they learned how to cope with stress in pregnancy (Table 3, Fig. 2).

| Main theme                      | Subtheme                        | Frequency |
|---------------------------------|---------------------------------|-----------|
| Relaxation                      | Not thinking                    | 10        |
|                                 | Feel relieve                    | 4         |
| Decrease in stress perception   | Decrease in stress perception   | 12        |
|                                 | Not perceiving stress           | 10        |
| Learning to cope with stress   | Learning how to cope            | 11        |
|                                 | Not caring                      | 8         |
|                                 | Not attributing a meaning       | 6         |
|                                 | Making affirmations             | 6         |
|                                 | Taking under control            | 6         |

P1 made a statement that ‘after doing yoga, stress really decreases. You know, I mean I can say that I feel less stressed thanks to yoga’.

P2 stated that ‘one feels that relieved, I feel that, emotionally, of course I think I feel overemotional because of pregnancy, but you know I feel relieved in general’.

P3 said that ‘I’m not that stressed. I’m not as stressed as before’.

P7 expressed that ‘before yoga, let me explain stress, there was delivery stress and psychological stress. But thanks to you, after yoga, I stress less over delivery and birth positions. Then I can say my stress level decreased by 80%’. 
P12 stated that ‘It (stress) sounds unimportant, I mean we shouldn't get stressed. I mean my baby is more important. I have more important stuff. I don't care that much anymore. I used to focus on that a lot before, but not anymore. After yoga, stress means something that people fictionalise in your subconscious. It's not so important. It's possible to get over that alone ... One can get over that (stress) by thinking that there is nothing more important that her’.

P13 emphasised that ‘I don't feel stressed like I did at first. I mean I have taken it under control a little more. But not (completely) yet ... I direct my mind toward the positive in general’.

P14 said that ‘I feel more relaxed, less tense. Also, I feel my muscles work better because I want to have a vaginal delivery’.

P19 stated that ‘I don't care at all. Stress means nothing to me. I don't think about it anymore’.

In short, the change in the expressions the women used to define stress before and after the intervention indicates that the prenatal yoga programme is effective in stress management.

Discussion

Principal findings of the study

To determine how effective, the prenatal yoga programme for stressed women is, the present study was conducted. Study results showed that prenatal yoga programme decreased stress perception of all pregnant women and revealed that all pregnant women stem the tide of stress. In understanding the changes that must be made to promote women's health, understanding the experiences of each pregnant women to the issue of stress perception in the prenatal period is an important step. The results of the present study show that the most important aspects of stress reduction in prenatal care were to help maintain the health of the mother, provide mentally and physically relaxation for the women during pregnancy, decrease stress perception and not perceive stress.

Before the prenatal yoga programme

It has been shown that, before attending to the prenatal yoga programme, women's perception of stress is generally high in the process of acceptance of pregnancy. Women have been trying to adapt to the pregnancy process from the moment they realised that they were pregnant. It is also determined that women are eager to confirm pregnancy symptoms, but they have negative emotions due to pregnancy. When the woman realises that she is pregnant, the pituitary gland is stimulated, the sympathetic nervous system is triggered and all body defence systems are activated. At this stage, developmental task is that the woman be able to accept her pregnancy [23]. It is found out for the first interview with the women in the research that the pregnancy that occurs without mental and physical preparations makes it difficult to accept the pregnancy. It is stated in the semi-empirical research with primiparous 100 pregnant women in Iran that the process of adaptation to the physical changes which is experienced especially in the early stages of pregnancy causes high perception of stress on pregnant women [24]. In the prospective research
with 78 primiparous pregnant women in China, it is determined that the stress perception is high due to the physical changes in the early stages of pregnancy [25, 26]. The research at issue, the women have generally remarked the reasons of high stress perception as trying to adapt to pregnancy, not feeling physically ready and individual problems that may occur related to pregnancy similar to symptoms in the literature.

Hence, one of the tasks of women in traditional societies is pregnancy and correspondingly motherhood. The duty socially undertaken by women, when consolidates with the stimuli from husband, peer group and family causes the woman to become pregnant at an unfavourable time. The woman may decide to become pregnant at an unexpected time and thereafter feel negative emotions [27, 28]. Ozorhan et al. indicated the symptoms of not accepting the pregnancy or the belief that there would be several hardships as the resistance towards pregnancy-related changes, the fact that there may be drastic changes in the lifestyle due to the pregnancy, worrying that their plan would fall true and having a sense of regret related to pregnancy [29]. Beydag indicated that intended pregnancy plays a crucial role in the woman's acceptance of pregnancy [28]. In this study, it has also been shown that there are unexplored feelings due to the unexpected pregnancy, and this situation causes high stress perception.

It is determined that pregnant women often feel lack of energy and tired under the perception of physical strength or inability to cope with stress. Healthy pregnancy depends on the ability to cope with the problems encountered. Exhaustion stage starts in the cases where the stress does not disappear. Continued and stressful experiences that cannot be overcome can disrupt the balance of the pregnant woman [30]. In this study, it is thought that the first focus ‘sense of self’ is dominant in pregnant women. In particular, it is thought that the pregnant woman and her partner are inadequate in terms of process and preparing for the changes. Although it is generally stated that she is willing to get pregnant, it is thought that the process of preparing for pregnancy is not completed mentally and physically. It is thought that acceptableness of pregnancy affected lots of factors such as beliefs and attitudes of women, sense of duty and obligation, relations and behaviours and past life experiences of women. It was emphasised in the research with 173 low-income primipara pregnant women in Colombia that when the situation of stress perception was high, the acceptance of the pregnancy was delayed [31]. In the prospective cohort study conducted in 10 public hospitals in four states of America, prenatal perception of emotional stress was evaluated in adolescent pregnant women. In the research, 154 adolescent pregnant women between the ages of 14 and 19 were followed up during the last 2 months of pregnancy and 16 months after the birth; face-to-face interviews were carried out with pregnant women for 90 min in every 6 months. In the research, it is determined that the mean score of perceived stress scale is 2.85 during the pregnancy period, and 58% of pregnant women perceived stress. It was also determined that pregnant women with high perception of stress is not sufficient in terms of parentage behaviour after the postpartum period [32]. On the other hand, in this research, the fact that the pregnancy of a particular woman is known by her family and social circle and her desire for positive feedback is evaluated as a proof of need for support. Therefore, the fact that pregnant women who have high stress perception must be diagnosed during the early stages of pregnancy and supporting with the proper approach became evident.

After the prenatal yoga programme
It was emphasised in the studies that the perception of stress in pregnancy disordered the mental functioning influenced negatively the fetal development and yoga decreased the perception of stress. In India’s central Chhattisgarh district, for 6 days, 50 min yoga including stances, breathing and omrn sound was practiced for women between the ages of 20 and 30 and those in 12th – 20th gestational week, and the effect of yoga on stress perception was evaluated. At the end of the yoga practice, it was found that pregnant women had a state of mental well-being, and their perception of stress decreased with a healthy and comfortable pregnancy process [33]. In the randomised controlled trial research in Bangalore in the south of India, 122 healthy pregnant women in 18th – 20th gestational week had one hour (1 h) of yoga per day; thus, it was found that yoga reduces perceived stress and improves physical autonomic response [28]. In San Francisco, it was observed that the perception of stress decreased continuously and significantly with seven weeks of yoga programme for healthy nullipara pregnant women in 12th – 32th gestational week [5].

In the phenomenological research conducted to evaluate the methods of overcoming the stress and self-sufficiency of women in Virginia, 12 women had eight weeks of yoga practice, and it was concluded that yoga improves women's methods of overcoming the stress and self-sufficiency [34]. In his review of six research articles, which he reached by scanning through six search engines, Curtis suggested that maternal stress affecting the body during pregnancy can be reduced by systematic yoga practice [8]. In this research, women in 12th – 28th gestational week were practiced yoga twice a week for 1 h during 4 weeks, and this group was compared with the group that had no yoga practice. Although the stress perception score decreased by 7.12 units in the yoga practice group according to the first application of VAS, the average increase in the control group was 1.35 units. In this study, as in the Bangalore region in southern India, it can be indicated that significant decrease of stress to the important effect of yoga on increasing the flexibility of the autonomic nervous system, thus improving the ability of the system to rapidly recover its baseline state after reacting [6]. Moreover, decreasing of stress perception after yoga can be attributed to the three reasons. First, the tense body muscles are replaced with deep relaxation because of the new stance. Second, slow and deep breathing and the control of autonomic nerve activity decreased involuntary physical responses. The third reason is that with focusing, pregnant women can relax by releasing their minds. The decrease in stress perception after yoga has parallel with other research findings. In the control group, weak cognitive coping methods manifested themselves with the increasing of stress perception score.

**Evaluation according to the content and process of yoga programme**

**Focusing**

In the research, pregnant women were asked to close their eyes in a comfortable sitting position and to listen to their internal physical functioning during the focusing. The different parts of the body were drawn attention, and focusing was performed on the uterus. They were asked to allow mental flow without thinking about the factors they perceived as stress. Mentally, it is emphasised that a separate heart beats in their bodies, and there is a separate body. Pregnant women were asked to put their left hands on their
chests and their right hands on their foetus. In this way, it is thought that they perceive the foetus better and the mother–baby interaction starts in the fetal period. In the North Carolina region of America, to evaluate the cognitive and mental effects of focusing, 24 individuals were subjected to 4 days and 20 min of focusing. It has been revealed that focusing decreases fatigue and anxiety, whereas it increases the well-being in the state of emotion, attention, visual and spatial coordination, memory and administrative functions [35]. Gothe reported that focusing in yoga if it is performed regularly for four weeks would improve cognitive performance in terms of quality [36]. Although there is no clear information about how long the focus should continue, the long-term focusing practices are thought to have positive effects on attention gathering, maintenance and actively fulfilling of mental functions, and also, it is thought that short-term focusing has positive effects on cognitive and mental state. In this research, focusing was applied for a total of 32 min for 4 weeks at least 3 min for each pregnant in the beginning of yoga. In the interviews, it is understood that focusing is mentally effective with expressions of pregnant women such as ‘trying to think more positively’, ‘focusing has affected me positively’, ‘happier’, ‘became more tolerant’, ‘I am positive’ and ‘I live positively’.

**Breathing**

Conscious breathing is the basic step of yoga practice. Jerath et al. reported that slow, purposeful and deep breathing stimulates the parasympathetic nervous system, by stretching the lung tissue and vagal nerves [37]. The activation of the parasympathetic nervous system produces a physiological response characterised by a decrease in heart rate, blood pressure, metabolic rate and oxygen consumption. Deep breathing improves mental flexibility, called neuroplasticity, by rebuilding neural pathways [38]. Dorle stated that there should be breathing exercise in yoga, and the breathing has positive effect on controlling responses of sympathetic nervous system [39]. In the researches, it is revealed that breathing for three min. has positive effects on psychological disorder such as stress, anxiety and depression [40–43]. In the research, pregnant women stated that as a result of three min. breathing practice, their respiratory tract were opened, and they performed more easy and regular breathing. It can be concluded that the breathing exercise in yoga contributes to bodily comfort, and pregnant women feel more energetic with the replacement of slack state by the physical energy flow.

**Pose (Asana)**

It is known that the physical awareness is increased with the yoga pose, and physical reactions to the stress agent are controlled [44]. It is reported in the literature that autonomic nervous system activity will be controlled if stretching poses in yoga performed 15 min each day [45]. In a research conducted in Iran, it was stated that the symptoms of mental illness decreased as a result of the application of physical postures in yoga practice. Also found in a research conducted in Arizona that flexibility, muscle strength and dynamism were increased [46, 47]. In this research, it can be assumed that the postures that is applied to pregnant women for an average of 35 min are helpful for establishing the mind–body connection and reaching a healthy and peaceful state. Increasing the cognitive awareness reduces recurrence of negative emotions and provides an opportunity for the pregnant woman to understand and accept the nature of notion and behaviours.
Deep relaxation

True development of attention and body awareness establish a ground for the pregnant woman to feel comfortable and relaxed [48]. Lots of studies that has been using deep relaxation exercises indicate similar results. In the research of Bastani et al. (2005), deep relaxation is applied to pregnant women who had their first pregnancy, in the second trimester, and it is found out that perceived stress score decreased significantly [49]. Teixeira et al. (2005), in their randomised controlled trial with 58 pregnant women in the second trimester, reported that heart rate and serum cortisol levels remained within normal limits and stress perception decreased in the group that applied deep relaxation [50]. In this research, it is observed that pregnant women were deeply relieved in the deep relaxation position in the last 10 min of one hour yoga exercise and deep relaxation deepened as they learned to do yoga. In pregnant women, instead of perceiving and feeling stress with deep relaxation, it was provided to remove stress and learn to internalise the situation.

Study limitations

The most significant strength of research was that it was pragmatic. It was conducted in two big university hospitals in Izmir, the sociocultural range of pregnant women was wide and the prenatal yoga programme was made by the midwife professionally and complimentarily. Other strengths of research are as follows: The data collection process of research was conducted with hard effort within six months period in two institutions. Therefore, the effects of possible corporate and seasonal changes were made neglectable. All women who participated in the study performed yoga postures in an environment where they felt accomplished and safe. So there were no maternal and fetal injuries.

In the research, pregnant women with the same characteristics came together. Therefore, talking to each other about their pregnancies could not be prevented. Also, they gave very simple and short answers to the researcher's questions. These factors might be influencing the results that can be considered as the limitation of this study.

Conclusions

This research highlights that the prenatal yoga programme is both quantitatively and qualitatively effective in managing stress.

Implications for clinical practice

Prenatal yoga is an excellent choice for any stressed pregnant woman to prepare herself physically and emotionally for childbirth. Focusing, breathing, physical poses and deep relaxation can help to strengthen muscles and relieve stress. Based on the evidence presented in this paper, a movement towards offering prenatal yoga classes in hospitals everywhere could greatly improve the health status of pregnant women and also infants around the world. This inexpensive and easy holistic intervention can be performed in a group setting or in the privacy of the pregnant woman's home. Midwives should begin to educate their
women about prenatal yoga and its benefits while also advocating for prenatal yoga programmes to be established in healthcare institutions everywhere.

Implications for research

In the literature, it was determined that the yoga intervention had acute effects on the biological parameters as well as its positive effects on the psychological, physiological and cognitive functions. In our study, VAS was only used to determine the stress perception. It may be suggested that the future studies should reveal the concrete biochemical evaluations or physiological indicators (such as hormone parameters) as well as the perceptual measurements.

Abbreviations

GAS: General Adaptation Syndrome; VAS: Visual Analogue Scale; SSIF: Semi-Structured Interview Form; NCSS-PASS: Statistical and Power Analysis Size Software; PWDF: Pregnant Woman Description Form; SPSS: Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

The study was approved by the institutional ethics committee of Ege University Medical Faculty (Decree No. 15 – 10/3) in accordance with the Declaration of Helsinki Research Principles. Written informed consent was obtained from all women.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to the small primarily qualitative nature of the study, but are available from the corresponding author on reasonable request.

Competing interests

The authors warrant that the manuscript is an original contribution to the literature and has not been previously published. Each author has participated in the study to a significant extent. The authors have no conflicts of interest to disclose.

Funding
Financial support for this study was provided by Ege University Scientific Research Project (No. 2016/ASYO/ 013). The foundation was not involved in the study design, collection, analysis, and interpretation of data or in writing the manuscript.

**Authors’ contributions**

ZBA contributed significantly to the conception and design of the study, conducted the data collection and delivery of the yoga intervention, led the analysis and interpretation of data, provided the initial and subsequent drafts of paper, and gave final approval of the version to be submitted for publication. SEG contributed significantly to the conception and design of the study, supported the analysis and interpretation of data, closely supported the initial and subsequent drafts of the paper, and gave final approval of the version to be submitted for publication.

**Acknowledgements**

We would like to thank the women for participating in our study. We are thankful to the participants for committing their time to have the interview with us and providing reliable information. We are grateful to Ege University Planning and Monitoring Coordination of Organizational Development and Directorate of Library and Documantaion for their support in editing and proofreading service of this study. This study has been accepted as an oral presentation at the 32nd ICM Triennial Congress, which is being held in Bali, Indonesia, 30 May – 03 June 2021.

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Figures
Figure 1

Changes in the VAS scores in the prenatal yoga programme group and control group
Figure 2

The map of expressions that women used for defining their opinions after prenatal yoga programme

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