

Game Usage in Pregnant Women at Early Gestation in Japan

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Abstract

Background: Gaming addiction is becoming a problem in young women. However, there has been no report on game usage in pregnant women.

Objective: The aim of this study was to determine the current status of computer game usage and the existence of game addiction and also to determine the associations of game usage time with lifestyle, personal relationships and thoughts about games in pregnant women at early gestation.

Subjects and Methods: We recruited pregnant women who received a pregnancy checkup during the first trimester. We distributed QR codes for the online survey. We conducted a web questionnaire survey including Internet Gaming Disorder Scale (IGDS) in 178 pregnant women.

Results: The proportion of women with game usage was 40.4%. The mean game usage time per day was 72.9 minutes. There were no pregnant women whose IGDS score was more than 5 points. We divided 72 participants into three groups by tertile according to game usage time per day: group A (≤ 30 mins), group B (> 30 and ≤ 90 mins) and group C (> 90 mins). There were no significant differences in current smoking, alcohol drinking and daily life behavior among the three groups. There were significant differences in the proportions of women who had difficulty for establishing personal relationships by face-to-face communication and who thought that they might have a game addiction among the three groups. Pregnant women with longer game usage time had a high IGDS score.

Conclusion: We showed for the first time the proportion of pregnant women who use games in the early period of gestation. Pregnant women with longer game usage time may require careful observation.

Keywords: pregnant woman, game usage, gaming disorder

1. Introduction

Gaming addiction is becoming a problem with increases in game use and Internet use. Internet gaming disorder (IGD) was included in the 5th edition of the Diagnostic and Statistical Manual Disorders (DSM-5) in 2013 (American Psychiatric Association, 2013). A systematic review of 37 cross-sectional studies and 13 longitudinal studies showed that the global prevalence of IGD ranged from 0.7% to 27.5% (Mihara & Higuchi, 2017). In another systematic review published in 2020, it was shown that the prevalence of IGD in general populations ranged from 0.21% to 55.77% in a scoping review including 160 studies (Darvesh et al., 2020). Although the World Health Organization (WHO) included gaming disorder (GD) in the 11th revision of the International Classification of Diseases (ICD-11) in 2019, there have been few studies on the prevalence of GD based on ICD-11.

In Japan, the results of a survey on GD in subjects aged 10-29 years were reported in 2019. In that survey, the proportion of game users was 85.0% and the proportions of subjects who used games for 3 hours or more and 6 hours or more on weekdays were 18.3% and 2.8%, respectively (National Center for Addiction Services Administration, 2019). The prevalence of ICD-11 GD estimated by the Gaming Engagement Screener (GAMES) test was reported to be about 5% in the young population in Japan (Higuchi et al., 2021). In 3rd grade junior high

school students, the proportions of online game users were 22.6% in male students and 11.7% in female students in 2012, and the proportions had increased to 59.1% in male students and 27.2% in female students in 2017. In 3rd grade senior high school students, the proportions of online game users were 20.9% in male students and 8.3% in female students in 2012, and the proportions had increased to 54.0% in male students and 30.3% in female students in 2017 (Ministry of Health, Labor and Welfare, 2013, 2017). Based on the results of those previous surveys, some concerns related to GD may have occurred in the younger generation in Japan.

It has been reported that the frequency of game usage in males is higher than that in females (Padilla-Walker, Nelson, Carroll, & Jensen, 2010; Rehbein, Kleimann, & Mössle, 2010). Being male has been reported as a risk factor for pathological gaming in the USA, Singapore and Norway (Gentile, 2009; Gentile et al., 2011; Mentzoni et al., 2011). However, issues regarding game usage are found not only in men but also in women. For young women, it has been reported that the frequency of video game use was negatively associated with self-worth and social acceptance (Padilla-Walker et al., 2010). In addition, concerns about the associations of game usage with daily behaviors, self-perception and relationships with others have been increasing. Padilla-Walker et al. reported that video game use during emerging adulthood was linked to negative outcomes, alcohol drinking, drug use, and lower quality of relationships with friends and parents (Padilla-Walker et al., 2010).

On the other hand, several issues due to game addiction in postpartum women with child-rearing are becoming evident. Stockdale et al. reported that pathological gaming was related to increased depressive symptoms and decreased feelings of parental efficacy for mothers as well as fathers (Stockdale & Coyne, 2020). It has not been clarified when problematic game usage in postpartum women occurs for the first time. It might occur during the gestation period. There has been no report on the actual states of game usage and the existence of game addiction in pregnant women. Considering that game usage has become widespread among the young generation in recent years, game usage may physically and psychologically affect the daily life of pregnant women. Also, pregnant women may have conflict between game usage and lifestyle and thoughts about games.

The aim of this study was to determine the current status of game usage and the existence of game addiction and also to determine the association of game usage time with lifestyle, personal relationships and thoughts about games in pregnant women at early gestation.

2. Method

2.1 Research Design

We conducted this study by using an online questionnaire survey. Although this web study was performed three times (in the first trimester, second trimester, and third trimester) as a prospective longitudinal study, only the data obtained in the first trimester was analyzed in this study. The period of the first trimester in this study was from April to September, 2021. The survey was conducted at a birth center in Japan in which the number of births is approximately 700 per year. The necessary sample size was determined to be 172 by using effect size (0.3), α coefficient (0.05), power (0.95), and degree of freedom (2).

2.2 Data Collection

We recruited pregnant women who received a pregnancy checkup during the first trimester. We recruited pregnant women who are planning to give birth at the first antenatal check-up at the birth center, who have been confirmed by an obstetrician to be able to give birth at a primary care facility without any serious pre-pregnancy illnesses. We excluded women who did not consent to study participation, women whose ages are less than 20 years, women with multiple pregnancies, women without a spouse (or partner), and women who have a plan for transfer to another hospital during pregnancy. We also excluded women who had a history of treatment for severe hypertension, diabetes mellitus, schizophrenia, severe depression before pregnancy, and women who need antenatal care at a tertiary care facility, such as women who are currently undergoing treatment. Pregnant women who had difficulties answering the questionnaire because of mental and physical problems were also excluded. The researchers explained the aims of the study and methods used in the study to 333 pregnant women who visited the birth center for a medical check in the first trimester. For the 301 pregnant women who agreed to participate in the study, we distributed QR codes for the online survey and conducted the survey by using Survey Monkey (an online questionnaire creation and operation tool).

The questionnaire consisted of four parts with questions on background characteristics, daily life behavior in the early gestation period, game usage time during the COVID-19 pandemic, and Internet Gaming Disorder Scale (IGDS) (Lemmens, Valkenburg, & Gentile, 2015). The first part regarding background characteristics included questions on current weeks of pregnancy, living situation, occupation, time of starting to use offline games (not

connected to the Internet), time of starting to use online games (connected to the Internet), presence of game usage in the past month, and game usage time per day in the past month. The second part regarding daily life behavior in the past month included questions on sleeping hours per day, smoking habits, alcohol drinking habits, presence of regularity in wake-up time and bedtime, presence of a day when the subjects could not sleep well due to game usage, presence of a day when the subjects could not cook their own meal due to game usage, presence of a day when the subjects could not eat regularly (3 meals/day) due to game usage, frequency of eating ready meals (e.g., instant foods, pre-cooked foods, and fast foods), presence of friends or acquaintances (other than family) in whom the subjects can consult with by face-to-face communication, whether the subjects feel that it is difficult to achieve personal relationships by face-to-face communication, whether the subjects think that game usage has had a negative effect on their child/children's development, whether the subjects think that game usage is addictive, whether the subjects have ever thought that they have game addiction, and whether the subjects have ever thought that they could not use a game sufficiently because of their pregnant state or because of child-rearing. In the third part of the questionnaire, we asked whether game usage time had increased or not due to the COVID-19 pandemic. The fourth part included questions on IGDS. IGDS is a dichotomous 9-item IGD scale (Lemmens et al., 2015). The answer is yes (1 point) or no (0 point), and the cutoff value is 5 points. The Japanese version of IGDS was translated by Sumi (Sumi et al., 2018). The items of questions are shown in Table 3.

2.3 Ethical Considerations

This study was approved by the Ethics Committee. We conducted a web survey anonymously. Each subject was provided with a research explanatory document setting out an explanation about the research. We informed the subjects that they are deemed to consent to participation in the research by inputting the online questionnaire and by checking the boxes. In addition, we obtained a consent from each subject for obtaining information including information on age and parity from medical records. Consent from each subject for participation was based on an explanation that participation in the survey is voluntary, refusal to participate is not harmful, and that the data obtained would not be used for purposes other than this study.

2.4 Statistical Analysis

Background characteristics of the subjects were analyzed by descriptive statistics. A comparison of the presence of gaming usage between offline games and online games was performed by the chi-square test. A comparison of the starting ages of offline games and online games was performed by the Mann-Whitney test. We used the chi-square test to compare game usage time with smoking habits, alcohol drinking habits, sleep disturbances, frequency of eating ready meals, presence of difficulty for establishing personal relationships, and thinking about the influence of game usage on child/children's development. We used Fisher's exact test to compare game usage time with items regarding daily life and thinking about gaming usage and game addiction. Comparisons of IGDS scores among the groups according to game usage time were performed by using the Kruskal-Wallis test and the Mann-Whitney U test with the Bonferroni test. A p value less than 0.05 was considered to be statistically significant. All statistical analyses were conducted using SPSS statistics ver.27.0 (IBM Corp.).

3. Results

3.1 Background Characteristics

Responses were obtained from 182 of the 301 pregnant women (recovery rate: 60.5%). We excluded 4 questionnaires with incomplete answers, and data for 178 participants were analyzed (effective response rate: 59.1%).

The mean age (\pm standard deviation: SD) of the subjects was 32.1 (\pm 4.5) years and mean gestational weeks (\pm SD) were 10.7 (\pm 2.0) weeks. The background characteristics of the subjects are shown in Table 1.

Table 1. Background characteristics of the subjects (n = 178)

	n	%
Parity		
Primiparous	90	50.6
Multiparous	88	49.4
Composition of a family		
Husband	84	47.2
Husband and child/children	81	45.5
Extended family	13	7.3
Employed		
Yes	144	80.9
No	34	19.1
Experience of game use (Offline games)		
Yes	152	86.0
No	25	14.0
Experience of game use (Online games)		
Yes	127	71.3
No	51	28.7
Game use in the early gestation period		
Yes	72	40.4
No	106	59.6

The proportions of subjects who used offline games and online games were 86.0% and 71.3%, respectively. The proportion of women who used offline games before using online games was higher than that of women who had not used offline games before using online games, and there was a significant difference between these women ($p < .001$). The mean (\pm SD) age of starting online games (19.2 ± 5.7 years) was significantly higher than the mean age of starting offline games (9.3 ± 3.5 years) ($p < .001$). The proportion of women at early gestation who used games was 40.4%.

3.2 Daily Life and Thoughts about Game Usage

For 72 women who used games the early period of their pregnancies, game usage time per day varied from 10 to 300 minutes, and mean game usage time (\pm SD) was 72.9 ± 67.3 minutes. Aspects of daily life behavior including smoking habits, alcohol drinking habits, sleeping habits and dietary habits are shown in Table 2. The mean (\pm SD) number of sleeping hours per day was $7.2 (\pm 1.4)$. The proportion of women who could not sleep sufficiently due to game usage and the proportion of women who could not have regular meals due to game usage were low (4.2-5.6%).

Thoughts about game usage in pregnant women are also shown in Table 2. The proportion of women who definitely felt or felt to some degree that gaming usage induces game addiction was about 89%. The proportion of women who felt definitely or felt to some degree that game usage by mothers has a negative influence on the environment for child/children's development was 72.3%. In addition, 19.4% of the pregnant women felt to some degree that they may have game addiction.

Table 2. Daily life behavior and thoughts about game usage (n = 72)

	n	%
Smoking habit		
No	53	73.6
Yes but stopped smoking before pregnancy	16	22.2
Yes but stopped smoking after pregnancy	2	2.8
Current smoking	1	1.4
Alcohol drinking		
No	14	19.4
Yes but stopped alcohol drinking before pregnancy	38	52.8
Yes but stopped alcohol drinking after pregnancy	20	27.8
Current drinking	0	0.0
Regularity of wake-up time and bedtime		
Yes	55	76.4
No	17	23.6
Presence of days on which you could not sleep due to game use		
Frequently	0	0.0
Sometimes	4	5.6
Not at all	68	94.4
Presence of days on which you could not cook own meal		
Frequently	0	0.0
Sometimes	3	4.2
Not at all	69	95.8
Presence of days on which you could not eat regularly (3 meals /day) due to game use		
Frequently	1	1.4
Sometimes	2	2.8
Not at all	69	95.8
Frequency of not taking time to cook		
Almost every day	7	9.7
3-4 days/ week	19	26.4
1-2 days/ week	33	45.8
1-2 days/ month	7	9.7
Seldomly	6	8.3
Presence of friends and acquaintances (other than family) with whom I can consult face-to-face		
No	6	8.3
Yes	66	91.7
To achieve personal relationships by face-to-face communication		
Difficult	25	34.7
Not difficult	47	65.3

I think that game usage by mothers produces a negative environment for child/children's development		
Agree	4	5.6
A little agree	48	66.7
Disagree	20	27.8
I think that game usage is addictive		
Agree	31	43.1
A little agree	33	45.8
Disagree	8	11.1
I think that I may have a game addiction		
Agree	0	0.0
A little agree	14	19.4
Disagree	58	80.6
I think that I could not use gaming sufficiently due to pregnancy and child rearing		
Agree	1	1.4
A little agree	7	9.7
Disagree	64	88.9

3.3 Internet Gaming Disorder Scale (IGDS)

The results for IGDS in pregnant women who used games in their early period of gestation are shown in Table 3. Two (2.8%) of the women had 2 points, 10 (13.9%) of the women had 1 point and 60 (83.3%) of the women had 0 points. There were no pregnant women for whom the IGDS score was more than 5 points, a score that indicates a high level of dependence on Internet games.

Table 3. Result of Internet Gaming Disorder Scale in pregnant women (n = 72)

	Yes		No	
	n	%	n	%
Have there been periods when all you could think of was the moment that you could play a game?	1	1.4	71	98.6
Have you felt unsatisfied because you wanted to play more?	1	1.4	71	98.6
Have you been feeling miserable when you were unable to play a game?	2	2.8	70	97.2
Were you unable to reduce your time playing games, after others had repeatedly told you to play less?	2	2.8	70	97.2
Have you played games so that you would not have to think about annoying things?	5	6.9	67	93.1
Have you had arguments with others about the consequences of your gaming behavior?	0	0.0	72	100.0
Have you hidden the time you spend on games from others?	0	0.0	72	100.0
Have you lost interest in hobbies or other activities because gaming is all you wanted to do?	2	2.8	70	97.2
Have you experienced serious conflicts with family, friends or partner because of gaming?	1	1.4	71	98.6

3.4 Daily Life, Thoughts about Game Usage and IGDS Depending on Game Usage Time

To examine the relationships of game usage time with daily life behavior, thoughts about game usage and IGDS, we divided 72 pregnant women who used games during the early gestation period into three groups by tertile according to game usage time: 34 women (47.2%) in whom game usage time per day was ≤ 30 mins (group A), 19 women (26.4%) in whom game usage time per day was > 30 and ≤ 90 mins (group B), and 19 women (26.4%) in whom game usage time per day was > 90 mins (group C).

Comparisons of various factors depending on game usage time are shown in Table 4. There were no significant differences in current smoking, alcohol drinking and daily life behavior among the three groups according to game usage time. There was a significant difference in the proportions of women who had difficulty for establishing personal relationships by face-to-face communication among the three groups ($p=.022$), and the proportion of such women was high in group C. Also, there was a significant difference in the proportions of women who thought they might have game addiction among the three groups ($p=.014$), and the proportion of such women was high in group C. There was a significant difference in IGDS scores among the three groups depending on game usage time ($p = .034$). The IGDS score in group C was significantly higher than that in group B ($p = .029$).

Table 4. Daily life behavior and thoughts about gaming use depending on game usage time (n = 72)

	Group A		Group B		Group C		p value
	n	%	n	%	n	%	
Smoking habit ^b							
No	27	37.5	13	18.1	13	18.1	.648
Yes	7	9.7	6	8.3	6	8.3	
Alcohol drinking (before pregnancy) ^b							
No	25	34.7	13	18.1	14	19.4	.911
Yes	9	12.5	6	8.3	5	6.9	
Regularity of wake-up time and bedtime ^a							
Yes	25	34.7	17	23.6	13	18.1	.256
No	9	12.5	2	2.8	6	8.3	
Presence of days on which you could not sleep due to game use ^b							
Yes	2	2.8	0	0.0	2	2.8	.367
No	32	44.4	19	26.4	17	23.6	
Presence of days on which you could not cook own meal ^a							
Yes	1	1.4	1	1.4	1	1.4	1.000
No	33	45.8	18	25.0	18	25.0	
Presence of days on which you could not eat regularly (3 meals/day) due to game use ^a							
Yes	1	1.4	0	0.0	2	2.8	.336
No	33	45.8	19	26.4	17	23.6	
Frequency of not taking time to cook ^b							
≥ 3 days/week	11	15.3	7	9.7	8	11.1	.776
≤ 2 days/ week	23	31.9	12	16.7	11	15.3	
Presence of friends and acquaintances (other than family) with whom I can consult face-to-face ^a							
No	3	4.2	1	1.4	2	2.8	1.000
Yes	31	43.1	18	25.0	17	23.6	

To achieve personal relationships by face-to-face communication^b							
Difficult	11	15.3	3	4.2	11	15.3	.022*
Not difficult	23	31.9	16	22.2	8	11.1	
I think that game usage by mothers produces a negative environment for child/children's development^b							
Yes	26	36.1	11	15.3	15	20.8	.262
No	8	11.1	8	11.1	4	5.6	
I think that game usage is addictive^a							
Yes	29	40.3	17	23.6	18	25.0	.721
No	5	6.9	2	2.8	1	1.4	
I think that I may have a game addiction^a							
Yes	5	6.9	1	1.4	8	11.1	.014*
No	29	40.3	18	25.0	11	15.3	
I think that I could not use gaming sufficiently due to pregnancy and child rearing^a							
Yes	4	5.6	4	5.6	0	0.0	.123
No	30	41.7	15	20.8	19	26.4	
Score of Internet Gaming Disorder Scale^c							
0 points	28	38.9	19	26.4	13	18.1	.034*
1 point	5	6.9	0	0.0	5	6.9	
2 points	1	1.4	0	0.0	1	1.4	

^a Statistical analysis was performed by Fisher's exact test.

^b Statistical analysis was performed by the chi-square test.

^c Statistical analysis was performed by the Kruskal-Wallis test, Mann-Whitney U test (Bonferroni correction).

* $p < .05$

3.5 Game Usage and COVID-19 Pandemic

The questionnaire included a question on whether game usage time had increased or not after the start of the COVID-19 pandemic. The numbers (proportions) of women who answered increase, no change and decrease were 20 (27.8%), 50 (69.4%) and 2 (2.8%), respectively. There was no significant difference among the three groups, about the changes in game usage time after the start of the COVID-19 pandemic ($p = .911$).

4. Discussion

In the present study, we showed that the proportion of pregnant women who use computer games in the early gestation period was 40.4% and that the mean game usage time per day was 72.9 minutes. There were no pregnant women in whom the Internet Gaming Disorder Scale score was more than 5 points. Also, it was clarified that game usage time was associated with communication problems and thoughts about game usage.

This is the first report on the proportion of pregnant women who use computer games. It has been reported that the proportion of women aged 10-29 years in Japan who used games was 77.4% (National Center for Addiction Services Administration, 2019) and that the proportion of female university students aged 18-25 years in the USA who used computer games was 47% (Padilla-Walker et al., 2010). Since the mean age of pregnant women in the present study (32.1 years) was higher than that in previous studies, a simple comparison of the proportions cannot be made. However, the proportion of pregnant women who use computer games might be low. Recently, online game usage by junior and senior high school students in Japan has been increasing (Ministry of Health, Labor and Welfare, 2013, 2017), suggesting that game usage by pregnant women will increase in the future. Therefore, it is necessary to clarify potential issues regarding game usage in pregnant women.

In pregnant women in the early gestation period, we showed that the mean gaming time was 72.9 minutes and that

gaming time was more than 3 hours per day in 12.5% of the women. This proportion is similar to the proportion in a previous study (National Center for Addiction Services Administration, 2019). It was reported that video game usage time in girls (56 mins) was shorter than that in boys (90 mins) among students whose mean age was 15.3 years. It was also reported that the proportions of subjects in whom game usage time was more than 2.5 hours were 12.6% in girls and 39% in boys in Germany (Rehbein et al., 2010). In Japan, it has been reported that the proportions of subjects in whom gaming time was more than 3 hours on weekdays were 24.6% in men and 10.4% in women in a young population aged 10-29 years (National Center for Addiction Services Administration, 2019). There are gender differences in the contents of Internet use. Women are more likely than men to use the Internet for communication and not so much for games (Jackson, Ervin, Gardner, & Schmitt, 2001). It has been reported that the proportions of women who used role-playing and shooter games were lower than those of men (Rehbein et al., 2016). The gender differences in the content of Internet use and game use may be a factor in the difference in game usage time.

In the present study, individual differences in game usage time were found since game usage time varied from 10 minutes to 300 minutes per day. Use of games might not cause problems for all pregnant women. Longer game usage time may influence daily life behavior and thoughts about game usage. It has been reported that video game usage was associated with drinking behaviors and greater drug use in students aged 18-25 years in the USA (Padilla-Walker et al., 2010).

The Chinese government limits all online gaming companies' service hours for minors to one hour (The Chinese government, 2021). In Japan, the Japan Pediatric Society recommends limiting video games to no more than 30 minutes a day (Japan Pediatric Society, 2004). Regarding pregnant women, the reality of game use itself has not been studied in the world. Since the threshold for overuse of games has not been considered, we believe that it is an important issue to clarify for the future.

In women with the early stages of pregnancy, deterioration of physical condition due to hyperemesis and increased sleep time due to increase in progesterone are observed. Therefore, the percentage of women who use games and the amount of time they use games obtained from this survey may be limited to the first trimester of pregnancy, and may differ from the results for women before pregnancy.

In the present study, we could not find differences in smoking habits, alcohol drinking and daily life behaviour depending on game usage time. The reason may be that pregnant women tend to pay attention to healthy life habits including diet and sleeping status and tend to avoid smoking and drinking alcohol. If the number of pregnant women with game usage and the time of game usage increases in the future, associations of game usage with smoking habits, alcohol drinking and daily life behavior may occur. Therefore, it is necessary to pay attention to game usage in pregnant women.

Padilla-Walker et al. reported that video game use was associated with lower quality of relationships with friends and parents, lower self-worth and lower perceived social acceptance (Padilla-Walker et al., 2010). We also found that a high proportion of pregnant women with longer game usage time had difficulty in establishing personal relationships by face-to-face communication. However, a causal relationship between longer game usage time and difficulty in establishing personal relationships has not been clarified.

It has been reported that the prevalences of IGD in a general population were 0.21–57.50% in men and 0.25–26.09% in women (Darvesh et al., 2020). The reason of wide ranges of prevalence is thought to be differences in populations included or the methods used to diagnose IGD. Recently, the GAMES test for ICD-11 GD as a new scale has been developed by Higuchi et al. in Japan (Higuchi et al., 2021). The estimated prevalence of ICD-11 GD by using the GAMES test was 5.1% (7.5% in men and 2.5% in women) in a general young population aged 10–29 years. The estimated prevalence according to age class was 1.5% in individuals aged 25–29 years, an age range that is close to the age range of our subjects, and there has been no report for women aged more than 30 years (Higuchi et al., 2021). We reported for the first time IGDS scores in pregnant women and we found that there were no women in whom the IGDS score was more than 5 points. The mean age of subjects in the present study was higher than that in the previous study (Higuchi et al., 2021). It has been shown that the estimated prevalence of ICD-11 GD tended to be lower in older subjects (Higuchi et al., 2021). We found that the IGDS score was significantly higher in the group with longer game usage time. We also found that pregnant women with longer game usage time are likely to feel that they may have a game addiction. Even if pregnant women in the early gestation period have been found to be negative for GD by IGDS screening, pregnant women with a long game usage time would require careful observation.

With regard to Internet addiction, it has been reported that there was a relationship between Internet addiction and poor quality of life in pregnant and postpartum women in China (Yang et al., 2022). It has also been reported that

use of online games is an important factor as a determinant for Internet addiction (Chou et al., 2005). Thus, various issues that have been found in Internet use may be found in pregnant women with problematic gaming use in the future.

This is a first report on the proportion of pregnant women who use computer games. However, this study has several limitations. First, a causal relationship was not clarified since this study was a cross-sectional design. Second, we recruited subjects in a limited area and the number of subjects was small. Generalization of the results obtained in the present study is therefore limited. Also, it has been reported that use of violent video games was associated with more sexual partners, lower quality of relationships with friends and parents, and lower perceived social acceptance (Padilla-Walker et al., 2010). Factors related to daily life behavior are different depending on the contents of the game. We did not examine the contents of the games in detail. We did not examine the quality of relationships with partner and others before pregnancy, and women's gaming habits before pregnancy. Factors such as playing games to relieve boredom when not working, early pregnancy problems, partner status and pre-pregnancy activities may be relevant.

Women with a past history of psychological diseases, including schizophrenia, severe depression, or women who are currently treated with psychological diseases were excluded. These women are necessary to manage at advanced medical facilities. In the present study, we targeted healthy pregnant women and clarified the current situations of game use in these women. However, we could not exclude pregnant women who complained of mild physical and mental disorders.

In conclusion, the proportion of pregnant women in the early gestation period who used computer games was 40.4%. Pregnant women with longer gaming usage time had a higher IGDS score and included a high proportion of women with difficulty in establishing personal relationships by face-to-face communication and a high proportion of women who thought that they might have a gaming addiction. Pregnant women with long game usage time would require careful observation.

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Authors' contributions

All authors developed the conception and design of the study. All authors contributed to the collection, analysis, and interpretation of data. All authors drafted the article and contributed to the revision.

Ethical Approval

This study was approved by the Ethics Committee of Tokushima University Hospital (Approval No. 3945).

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Competing Interests Statement

The authors have no conflicts of interest directly relevant to the content of this article.

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