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The Effect of Smartphone Addition, Parenting Efficacy, Antenatal Stress and Fatigue on Depression among Pregnant Women

Soon Jung Yoon[1]
Doctoral Student, Department of Nursing, Kongju National University, Gongju, South Korea ppotto99@naver.com

Hee Kyung Kim[2]*
Professor, Department of Nursing Kongju National University, Gongju, South Korea hkkim@kongju.ac.kr
**Corresponding Author*

Abstract
The purpose of this study is to identify the relationship between addiction to smartphones, parenting efficacy, antenatal stress, fatigue and depression and to verify the predicting indicators that affect depression. Methods: Study subjects were pregnant women who were patients of M general hospital for women in city S, from February 23 to March 5, 2015. A self-reported questionnaire was used. Data analysis was done using SPSS Win. 18.0 program for a t-test and ANOVA on the difference in depression across general characteristics of pregnant women. Pearson's correlation coefficient was analyzed to identify the variables related with depression in pregnant women. Predicting indicators for depression were analyzed using Stepwise Multiple Regression. Results: The results show that the degree of depression was an average of 12.89 (±7.97) points, with 30.2% (42 subjects) who had a depression score of 16 or higher. Their depression score was 22.93 (±5.64) points. Depression was correlated with age, health status and support from the husband ($p<.01$). The higher the degree of smartphone addiction ($r=.234$, $p<.05$), antenatal stress ($r=.520$, $p<.001$) and fatigue ($r=.458$, $p<.001$), the more severe was depression. Predicting indicators for depression were antenatal stress, fatigue and age, which explained about 34.4% of depression in pregnant women. Among them, the explanatory power of antenatal stress was highest at 26.5% ($p<.01$). Conclusion: The degree of addiction to smartphones is related with the depression of pregnant women and thus education programs on smartphone usage and nursing mediation programs for antenatal stress and fatigue management is in need. Additional studies on these topics as well as smartphone addiction are recommended.

Keywords: Pregnant Women, Smartphone Addiction, Parenting Efficacy, Antenatal Stress, Fatigue, Depression

Introduction

Women are known to have a twice higher incidence rate for depression compared to men. Incidence is highest when they give birth. As pregnancy is an important and happy event for not only women but also the entire family, depression in pregnant women affects the women pre and post-partum, child and family members. When a pregnant woman is depressed, her stress index is high and attachment between the mother and the fetus falls [1, 2], leading to higher risks of delayed growth of the fetus [3]. Depression in pregnant woman can lead to suicide, one of the highest causes of death in mothers [4]. 50% of those who had depression during pregnancy often experience post-partum depression [5]. Post-partum depression lowers the perceived quality of life in the mother, increases fatigue [6], increases the risk of health issues in the child and undermines satisfaction with marriage [7]. Therefore the negative effects of depression in pregnant women raise the need for depression management and related studies on pregnant women.

Meanwhile, Kt economics research institute reported that as of end of June, 2014, 70% of their mobile communication subscribers use smartphones, with mobile messengers and the internet being the most frequently used features [12]. Since smartphones allow social media networking, games and viewing of videos from the internet, long-term exposure can lead to side effects. Compared to traditional media, the interaction, convenience, mobility and immediacy of smartphones can lead to higher risk of addiction. Many studies on related topics have been undertaken [13,14] which offer data on how smartphone addictions can be a yardstick for mental health. It has also been reported that smartphone addiction is correlated with anxiety, stress, self-control, impulsiveness and depression [15, 16]. Moreover, studies on smartphones and mental health are being undertaken on many age groups [13,17] and are on the increase, but there have been no studies on the correlation of smartphone usage by pregnant women, their mental health and especially mental health. As such, this study seeks to develop a basic set of data for healthier smartphone usage by collecting data on smartphone usage among pregnant women. In particular, since nurses play an important role as a medical expert and provide consultation on the health of pregnant women, this study would be meaningful and timely at a time when fertility rates are at an all-time low.

Studies on the mental health of pregnant women to date have focused on single aspects such as socio-demographic factors including age, pregnancy period, education or family planning [8], how spousal support or antenatal stress affects the interaction between the pregnant woman and fetus [1-3], parenting efficacy [18], socio-psychological factors such as satisfaction with marriage or self-esteem [9] or physical factors such as fatigue [10] or satisfaction with sleep [11]. Parenting efficacy is one of the cognitive variables that can predict parenting activities after giving birth and was verified as a factor that reflects psychological traits [18]. Studies on parenting efficacy focused on mothers with infant children or elementary school students [19,20]. There are studies that

show the mother's addiction to smartphones affecting parenting efficacy [21], and higher self-efficacy lowering post-partum depression [20], but there have been many studies on the correlation between parenting efficacy and depression in pregnant women. Moreover, antenatal stress has been consistently studied in relation to mental health and it has been reported that higher antenatal stress negatively affects mental health [1-3]. Fatigue in pregnant women is also associated with hormones during pregnancy and thus for both the mother and the fetus, stress must be properly managed and relieved [22,23]. Studies show that fatigue varies according to pregnancy period and experience in childbirth [22]. Greater fatigue correlates with higher pregnancy stress [24] and thus this study seeks to review the effects on the depression of pregnant women.

This researcher identified the degree of depression in pregnant women and used variables of smartphone addiction, parenting efficacy, fatigue and antenatal stress to analyze the predicting indicators that affect depression. In doing so, the researcher seeks to present data on managing the health of pregnant women in particular in regards to smartphone usage and to help develop a nursing mediation program for depression in these women.

Purpose

The purpose of this study is to identify the correlation between smartphone addiction, parenting efficacy, antenatal stress, fatigue and depression in pregnant women to analyze the predicting indicators for depression. Specific objectives are as follows;

1) Understand the difference in depression across general characteristics of study subjects;
2) Understand the degree of smartphone addiction, parenting efficacy, antenatal stress, fatigue and depression;
3) Identify the correlation between the degree of smartphone addiction, parenting efficacy, antenatal stress, fatigue and depression;
4) Identify predicting indicators that would affect depression in study subjects.

Methods

Research design

This study is a narrative correlation study conducted to analyze the predicting factors for depression and to identify the correlation between the degree of smartphone addictions in pregnant women, their parenting efficacy, antenatal stress, fatigue and depression.

Subjects

Of the pregnant women who were patients of M general hospital for women located in city S, those who use smartphones were selected. With a significance level of .05, a medium effect size of 0.3 for the correlation analysis, and a power of 0.95, the G*power 3.1 program was used to calculate the number of subjects to be 138 [25]. Given the dropout rate of 10%, a total of 151 subjects were sampled, who were briefed on the purpose of the study and who signed a form of consent for participation.

Instruments

Smartphone Addiction

To measure smartphone addiction, the self-diagnosis measurement tool developed by the Korea Information Promotion Center was used. This tool consists of a total of 15 questions divided into four sub-categories of disorder in daily life, orientation towards virtual reality, withdrawal and tolerance. Using a Likert scale, 'very much so' was given 1 point and 'not at all' was given 4 points. The scores ranged from 16 points-64 points. Negative questions were reverse coded. A higher score indicates a more severe level of smartphone addiction. At the time of development, the tool's confidence level of Cronbach's alpha was .81. For this study, it was .89.

Parenting Efficacy

To measure parenting efficacy, the 18 question tool recomposed by Lee [27] based on the 37 question tool of 'measurement tool of a mother's child-rearing efficacy' originally developed by Choi and Chung [18] was used. Sub-categories were a total of five; general parenting capabilities (6 questions), healthy parenting capabilities (3 questions), communication skills (3 questions), learning guidance (3 questions) and disciplining capabilities (3 questions). Using a Likert scale, 1 point was given for 'not at all' and 5 points given for 'very much so'. Total scores ranged from 18 points-90 points. A higher score indicates a higher parenting efficacy of the mother. The confidence level was .92 for the study by Bae et al. [28] that used the same tool, and .93 for this study.

Antenatal Stress

To measure antenatal stress, the tool developed by Ahn [29] for women going through their first pregnancy was used. This tool consists of a total of 26 questions on baby-related stress (9 questions), spouse-related stress (6 questions) and pregnant woman-related stress (11 questions). The response 'not worried at all' was given 1 point, while 'always worried' was given 5 points. Total scores ranged 26-130 points, with higher scores indicating higher perceived stress. At the time of development, confidence level was .84 and for this study it was .93.

Fatigue

Fatigue was measured using the "Fatigue Continuum Form" developed by Pugh [30] for subjects in pregnancy, childbirth or reproductive periods. Consisting of a total of 30 questions on a 4 point scale, 'not at all' was given 1 point and 'always so' was given 4 points. The range of scores was 30 points-120 points. A higher score indicates higher level of fatigue. The confidence level in the study by Pugh was .91-.94, and in this study it was .90.

Depression

The 20 question CES-D (Center of Epidemiology Studies Depression Scale) developed by Radloff [31] and translated by Shin [32] was used to measure depression. There were four

sub-categories of depressed emotions (7 questions), positive emotions (4 questions), physical symptoms(7 questions) and interpersonal relationships (2 questions).Responses to the 20 questions were rated 0 for 'rarely feeling so' for a week over the course of a month, 1 point for 'sometimes', 2 .' points for 'fairly' and 3 points for 'most of the time. Questions that measured positive emotions were reverse-scored. Possible total scores were 0-60 points, with higher scores indicating a higher level of depression. Those with scores of 16 or higher are deemed to be likely to have depression. Confidence level for the study by Radloff [31] was .84-.90, for the study by Shin [32] was .89, and for this study it was .89.

Data collection

Data were collected through a structured questionnaire. This researcher and a trained research assistant and nurse explained the purpose of the study to the pregnant women waiting to be seen by a doctor. When they were willing to participate, they signed a written consent form and filled out the questionnaire. To reduce the measurement error, three meetings and training sessions were held for the data collectors so that the collectors could understand the questions thoroughly and provide consistent explanation to subjects. The questionnaire was filled out by the subjects themselves. Out of a total of 151 copies, 12 were excluded for insufficient responses and a total of 139 copies were analyzed. The survey was conducted from February 23 to March 6, 2015. It took about 15 minutes for each survey to fill out the questionnaire.

Ethical consideration

Before conducting the study, the proposal for the study was reviewed by the University's IRB (IRB No. KNU_IRB_2015_03). The board reviewed the content, procedures, briefing form for the subjects, consent form and questionnaire. After approval the study was launched. The study subjects were briefed on the purpose and intention of the study and were informed that the results of the study would only be used for research purposes and kept anonymous. Subjects participated out of free will and if they wished to no longer participate, they were given a contact number to tell the researchers of this. They were also given a small token of appreciation for their participation.

Data analysis

The collected data were analyzed using SPSS 18.0 program using the following method.

1) The general characteristics of pregnant women were analyzed for technical statistics and frequency.
2) The mean and standard deviation were calculated for the degree of smartphone addiction, parenting efficacy, antenatal stress, fatigue and depression.
3) The difference in depression across general characteristics was analyzed using t-test and ANOVA, while for post-verification was done using a Scheffé test.
4) Pearson's Correlation Coefficient was used to analyze the correlation between smartphone addiction in pregnant women and their parenting efficacy, antenatal stress, fatigue and depression.
5) A multiple regression analysis for each stage was conducted to identify the predicting indicators of depression while controlling for the factors of general characteristics that showed significant statistical difference.

Results

General characteristics of the subjects

The average age of pregnant women used as subjects in this study was 31.89(±3.82), with those between ages 31-35 accounting for the largest share of 54.7%. In terms of education, university education accounted for 80.6%, followed by graduate school education and high school education. In terms of jobs, the same number of people was housewives and full-time employees at 44.6% each. Those with a monthly income between 2 million to 4 million Won accounted for the highest share at 43.9%. Their pregnancy period was an average of 25.93(±10.06) weeks, with 47.5% of them at week 28. Of the subjects, 47.5% were satisfied with their health. The largest share of respondents at 77.7% was going through their first pregnancy. The average of births given was 1.24(±0.48). About 74.1% of subjects had planned for the pregnancy, and 81.3% were satisfied with the husband's support.

There was a difference in the level of depression across general characteristics, namely across age, health status and spousal support. Specifically, those aged 30 or under were more depressed than those aged 36 or higher. Those with less satisfying health status were more depressed than those who were satisfied with their health. Those unsatisfied with the husband's support were more depressed than those who were satisfied ($p < 0.05$)(Table 1).

Table 1: Difference of Maternal Depression according to General Characteristics

(N=139)

Characteristics	Categories	N (%)	Difference of Depression		
			M±SD	t or F	P (Scheffe)
Age (years)	≤30[a]	43(30.9)	15.70±8.64	4.945	.008
	31~35[b]	76(54.7)	12.17±7.66		(a>c)
	≥36[c]	20(14.4)	9.60±5.80		
Education level	≤ High School	13(9.4)	17.54±9.23	2.580	.079
	University	112(80.6)	12.52±7.92		
	≥ Graduate	14(10.1)	11.57±5.98		
Occupation	Homemaker	62(44.6)	14.08±8.58	1.937	.148
	Full-time	62(44.6)	12.45±7.78		
	Part-time	15(10.8)	9.80±4.97		
Monthly income (10,000won)	< 200	13(9.4)	15.46±9.53	2.411	.070
	200 ~ ≤400	61(43.9)	14.34±8.76		
	400 ~ ≤600	42(30.2)	11.17±6.59		
	≥ 600	23(16.5)	10.74±6.23		
Gestational Period (weeks)	≤ 15	24(17.3)	13.46±7.34	2.608	.077
	16~27	49(35.3)	14.69±8.60		
	≥ 28	66(47.5)	11.35±7.50		

Health Condition	Satisfied Unsatisfied	66(47.5) 73(52.5)	10.88±6.69 14.71±8.62	- 2.943	.004
Baby's order	1 2 ≥ 3	108(77.7) 28(20.1) 3(2.2)	12.86±8.29 13.00±7.19 13.00±3.46	.004	.996
Planned pregnancy	Yes No	103(74.1) 36(25.9)	12.48±7.71 14.08±8.68	- 1.042	.299
Support of Husband	Satisfied Unsatisfied	113(81.3) 26(18.7)	11.64±7.17 18.36±9.27	- 3.408	.002

The degree of smartphone addiction, fatigue, antenatal stress, parenting efficacy and depression in pregnant women

The smartphone addiction score of pregnant women was 29.58(±6.62) points. Parenting efficacy was 62.67±9.25 points, while antenatal stress was 70.12±15.58 points and fatigue was 57.67(±12.79) points. Depression scored 12.89±7.97 points. There were 42 subjects (30.2%) who had a depression score of 16 or higher and their degree of depression was 22.93±5.64 points (Table 2).

Table 2: Degree of Smartphone Addiction, Fatigue, Antenatal Stress, Parenting Efficacy and Depression in Pregnant Women

(N=139)

Variables		N(%)	M ± SD	Possible range	Actual range
Addiction		139(100)	29.58±6.62	16-64	16-50
Parenting Efficacy		139(100)	62.67±9.25	18-90	18-90
Antenatal Stress		139(100)	70.12±15.58	26-130	32-125
Fatigue		139(100)	57.67±12.79	30-120	30-114
Depression	Total	139(100)	12.89±7.97	0-60	1-39
	< 16	97(69.8)	8.55±3.83	0-15	1-15
	≥ 16	42(30.2)	22.93±5.64	16-60	16-39

The correlation of smartphone addiction, parenting efficacy, antenatal stress, fatigue and depression in pregnant women

There was a positive correlation between depression in pregnant women and their degree of smartphone addiction(r=.234, p<.05), antenatal stress (r=.520, p<.001) and fatigue (r=.458, p<.001). That is, pregnant women with greater smartphone addiction, antenatal stress and fatigue were more depressed (Table 3).

Table 3: Correlation among Smartphone Addiction, Parenting Efficacy, Antenatal Stress, Fatigue and Depression in Pregnant Women

Variables	Addic-tion r (p)	Parenting Efficacy r (p)	Antenatal Stress r (p)	Fatigue r (p)	Depre-ssion r (p)
Addiction	1				
Parenting Efficacy	-.229 (.007)	1			
Antenatal Stress	.339 (<.001)	-.222 (.009)	1		
Fatigue	.130 (.128)	.047 (.586)	.434 (<.001)	1	
Depression	.234 (.006)	-.126 (.139)	.520 (<.001)	.458 (<.001)	1

Factors affecting depression in pregnant women

To identify the predicting factors that might affect depression in pregnant women, variables that had shown significant statistical difference were used for a multiple regression analysis. Variables of general characteristics that showed correlation were age, satisfaction with health status and satisfaction with spousal support. Among independent variables, they were the level of smartphone addictions, antenatal stress and fatigue. Among these, satisfaction with health and satisfaction with spousal support were treated as dummy variables. In the multicollenearity test, the allowance was .79-.95 and the variance inflation factor (VIF) was 1.05-1.25, indicating no issues with multicollenearity for any variables.

The multiple regression shows that antenatal stress (β=.37, p<.001), fatigue (β=.27. p=.001) and age (β=-.15, p=.038) are statistically significant predicting variables. The three variables of antenatal stress, fatigue and age explained 34.4% of depression in the subjects, with antenatal stress being the most powerful predictive indicator at 26.5% of explanatory power (Table 4).

Table 4: Multiple regression analysis for Risk factors associated with Maternal Depression in Pregnant Women

Variables	B	SE	β	t	p
Constant	-.950	.189			
Antenatal Stress	.011	.002	.37	4.84	<.001
Fatigue	.010	.003	.27	3.53	.001
Age	-.104	.050	-.15	-2.09	.038

Dummy Coded : Body Condition(Satisfied=1, Unsatisfied=0), Support of Husband(Satisfied=1, Unsatisfied=0)
Adj. R^2=0.344, F=25.09, P<.001

Discussion

This study sought to provide a basic set of data for nursing mediation programs for depressed pregnant women by identifying the correlation between the degree of smartphone addiction in pregnant women and their parenting efficacy, antenatal stress, fatigue and depression.

The depression in pregnant women scored 12.89±7.97 points. When those with 16 points or higher are categorized as depressed, 30.2% (42 subjects) were depressed, with an average score of 22.93(±5.64) points. In the study by Kho [33] that used the same tool for measuring depression CES-D, the average score was 15.08±0.54 points with those with 16 points or higher accounting for 38.5%, indicating a higher depression score and greater frequency of depression compared to this study. In the study by Kim and Jung [8], about 25% were categorized as depressed which was lower than this study. Since about 30% of pregnant women are

identified as depressed, nursing mediation and consultation are required to identify and address the causes.

The score for smartphone addiction in pregnant women was 29.58±6.62 points. In the study by Kim et al. [16] conducted on pregnant women, on a scale from 1 point to 4 points, the average was 2.19±0.53 points. This is the equivalent of approximately 35 points in this study, which is higher than this study's results. According to the study by Hyun et al. [15], the usage time for smartphones and multi-srevices was correlated with addiction levels. Given that the average age of subjects in this study is over 30, it seems the relatively more leisure time and reluctance towards new information or new technology seem to have been relfected onto the results.

Parenting efficacy was 62.67±9.25 points, which is lower than the study by Bae et al. [28] conducted on women who moved through international marriages. In that study, the score was 67.67±12.14 points. The study by Park and Moon [34] conducted on mothers with infant children showed 3.09 points on a scale of 1-4, which is the equivalent of 66 points in this study. This is similar to that of Bae et al. [28] but lower than this study. This difference seems to be due to the subjects not having given birth yet in this study, while mothers with infant children are actually carrying out parenting tasks. This leads to a lower parenting efficacy in subjects for this study. Therefore, follow-up studies should be conducted on pregnant women for comparison.

Antenatal stress of pregnant women was 70.12±15.58 points. Preceding studies on the correlation between stress and depression in pregnant women are that by Kwon and Bang [3] and Yoon et al. [1]. In Kwon & Bang [3], the score was a similar 70.61±16.89 points, while in Yoon et al. [], it was lower at 76.45±17.24 points. This is because the study by Yoon et al. [1] was conducted on pregnant women who were taking medication. Nursing is required to keep the stress of pregnant women at a low level.

The score for fatigue in pregnant woman was 57.67±12.79 points, which is similar to the 56.74±12.36 in the study by Choi et al. [6] conducted on women who had given birth in the last 1-3 weeks. The facts that this mid-level fatigue is similar to or slightly higher than those who had just given birth seem to be due to the diversity in pregnancy weeks among subjects of this study. Morning sickness or sleep disorders during early weeks of pregnancy may have affected fatigue, and therefore a comparative study on fatigue across different pregnancy weeks must be conducted.

A comparison of depression across general characteristics of pregnant women show that those aged 30 or lower, those who were not satisfied with their health and those who were not satisfied with spousal support were more depressed than their counterparts. Kim and Jung [8] analyzed the factors affecting antenatal depression and noted that the younger the women's age, the greater the antenatal depression. This is similar to the results of this study. Kim and Ryu [9] showed an opposing result where a higher age was correlated with greater depression in their study on the correlation between depression levels and socio-psychological factors. According to Wee and Park [2], pregnant women in their 20s feel more anxious than those in their 30s, but they stated that this was not related to depression. This difference seems to be because of external variables such as a difference in subjects or difference in variables. Therefore repeated studies are needed as a follow-up. Dissatisfaction in health leading to greater depression is also in line with the study by Kim & Ryu [9] conducted on pregnant women visiting community health centers and the study by Wee & Park [2] conducted on pregnant women treated as obstetrician's clinics. In the study by Yoon et al. [1] conducted on pregnant women on medication, those who were on medication for preventive purposes had lower depression than those who were on medication for theapeutic purposes. This can be interpreted as meaning that those who are healthy or perceive themselves to be healthy, and those who work to improve their health sees improved self-esteem which lowers depression. The part about spousal support can be viewed from the larger framework about social support. Social support can be defined by the emotional, informational, material and evaluative support received from relatives, friends, neighbors, colleagues, social leaders and organizations[36]. However, in the case of pregnant women, support from husbands had a great effect on their depression. In preceding studies, a larger support from the husband reduced depression in pregnant women [1,2]. In this study, too, those satisfied with the husband's support had lower depression, indicating a need for programs that solicit support from husbands.

Correlation analyses between variables show that depression in pregnant women was correlated with the degree of smartphone addiction, antenatal stress and fatigue. There was no correlation with parenting efficacy. A higher degree of smartphone addiction was correlated with greater depression. While there are no preceding studies on correlation between smartphone addiction and depression in pregnant women and thus a direct comparison is difficult, a comparison can be estimated against other groups. In the study by Kim et al. [16] conducted on university students showed smartphone addiction correlated with depression. Hyun et al. [15] showed that the degree of smartphone addiction was correlated with depression in mothers of infant children. In this study, a higher smartphone addiction was correlated with a higher depression score. This suggests the need for continued study to better manage depression of pregnant women especially linked with smartphone use as smartphone addiction is associated with negative mental health.

There was no correlation between parenting efficacy and depression in pregnant women. In the study by Park and Rha [35] on women's belief in parenting and efficacy before and after childbirth, those who had given birth were more likely to emphasize the role as a parent than pregnant women. In Bae et al. [28], there was a high correlation between parenting activities and parenting efficacy. That is, there is probably a difference in parenting efficacy between those who had given birth and those who haven't yet where parenting only concerns expectations and not actual activities. Moreover, since subjects were in various stages of pregnancy, it appears that pregnant women in later stages of pregnancy would have felt less confident in parenting efficacy due to the fear about childbirth that is close. A program to improve parenting efficacy for pregnant women would be needed.

On antenatal stress, the study by Yoon et al. [1] or by Wee and Park [2] showed that higher antenatal stress is correlated with higher depression in pregnant women. On fatigue,

preceding studies show that depression and fatigue are correlated. In the study by Kim and Cho [10] conducted on fatigue and affecting factors in pregnant women, there was a positive correlation. Studies by Kim et al. [20] or by Choi et al. [6] also show that higher fatigue after childbirth was correlated with greater depression. In particular, antenatal stress and fatigue can be eased with the help and support of friends and family so nursing on social support would be needed.

Multiple regression analysis shows that the three variables of antenatal stress, fatigue and age of pregnant women explain 34.4% of depression. Antenatal stress had the highest explanatory power at 26.5%, which is in line with the study by Yoon et al. [1]. In Lee and Park [11], it, along with health status and self-esteem, explained 36.7% of antenatal depression.This suggests the importance of antestress management and the need for continued studies for developing a nursing mediation program.

Overall, age, health status and husband's support among the general characteristics were identified as factors associated with depression in pregnant women. Among independent variables, these were the degree of smartphone addiction, antenatal stress and fatigue. Among these, adjustable variables would be husband's support, degree of smartphone addiction, antenatal stress and fatigue. While smartphone usage has become essential to contemporary life, its side effects need to be better managed. Pregnant women in particular, need to make efforts to maintain physical and mental health. Friends and family should offer support to help them ease stress, and society needs to develop education programs that are healthy and interesting so that smartphone addiction can be prevented in pregnant women.

Conclusion

This study identified the degree of depression in pregnant women who were patients of M women's hospital located in city S who use smartphones, and verified the correlation between the degree of smartphone addiction, parenting efficacy, antenatal stress, fatigue and depression. Depression was correlated with age, health status, satisfaction with husband's support, degree of smartphone addiction, fatigue and antenatal stress. The three factors of antenatal stress, fatigue and age explained 34.4% of depression in subjects. The explanatory power of antenatal stress was the highest at approximately 26.5%. While parenting efficacy wasn't correlated with depression, it was correlated with the degree of smartphone addiction. Therefore, additional studies on parenting efficacy in relation to smartphone addiction are suggested. In conclusion, this study is meaningful in having identified the relation between depression in pregnant women and other factors and in having provided basic data for management of depression in pregnant women. In particular, as there are very few studies on metnal health related to smartphone usage, the study has provided important data necessary for developing a mental health mediation program for pregnant women who use smartphones.

This study is limited in that it was conducted in a limited geographic area and therefore may not be representative of the entire population. What is interesting is that while parenting efficacy is not correlated with depression, it is correlated with the degree of smartphone addiction (r=-.229, p=.007). This is line with the results of Hyun et al. [21] that showed that the degree of smartphone addiction in a mother affects parenting efficacy. This suggests the need for follow-up studies on parenting efficacy on subjects of pregnant women.

References

[1] Yoon, S. J., Kim, H. K., and Han. J, Y., 2014, "Influencing Factors of Depression in Drugs Exposure Pregnant Women", J Korean Soc Matern Child Health, 18(2), pp. 273-285.

[2] Wee. H., and Park. S. Y., 2012, "The Relationships between Anxiety, Depression, Prenatal Stress, Maternal-Fetal Attachment and Gratitude", J Korean Soc Matern Child Health, 16(2), pp. 274-286.

[3] Kwon. M. K., and Bang. K. S, 2011, "Relationship of Prenatal Stress and Depression to Maternal-Fetal Attachment and Fetal Growth", Journal of Korean Academy of Nursing, 41(2), pp. 276-283.

[4] Bang. K. S., 2008, "Impact of Maternal Depression on Their Children: A Literature Review", Korean Parent-Child Health Journal, 11(1), pp. 15-24.

[5] O'Keane. V., and Marsh. M. S., 2007, "Pregnancy Plus: Depression during pregnancy", BMJ: British Medical Journal, 334(7601), pp. 1003.

[6] Choi. S. Y., Gu. H. J, and Ryu. E. J., 2011, "Effects of fatigue and postpartum depression on maternal perceived quality of life (MAPP-QOL) in early postpartum mothers", Korean J Women Health Nurs, 17(2), pp. 118-125.

[7] Bang. K. S., 2011, "Infants' Temperament and Health Problems according to Maternal Postpartum Depression", J Korean Acad Nurs, 41(4), pp. 444-450.

[8] Kim. H. W., and Jung. Y. Y., 2010, "Influencing Factors on Antenatal Depression", Korean J Women Health Nurs, 16(2), pp. 95-104.

[9] Kim. E. S., and Ryu. S. Y., 2008, "The Relationship between Depression and Sociopsychological Factors in Pregnant Woman", J Korean Soc Matern Child Health, 12(2), pp. 228-241.

[10] Kim. Y. H., and Cho. O. H., 2012, "Factors Influencing Fatigue in Pregnant Women", J Korean Soc Matern Child Health, 16(1), pp. 80-88.

[11] Lee. E. J., and Park. J. S., 2013, "Status of Antepartum Depression and Its Influencing Factors in Pregnant Women", Journal of the Korea Academia-Industrial cooperation Society, 14(8), pp. 3897-3906.

[12] Son. Y. H., 2014, "Korean Smartlife - Analysis of smartphone using type", DIGIECO, Seoul.

[13] Choi. H. S., Lee. H. K., and Ha. J. C., 2012, "The influence of smartphone addiction on mental health, campus life and personal relations-Focusing on K university students", Journal of the Korean Data and Information Science Society, 23(5), pp. 1005-1015.

[14] Cho. D. U., Kim. H. D., and Kim. B. H., 2014, "A Study on the Smartphone Addiction with Housewives to 30~50", J.Korean Inst. Commun. Inf. Sci., 2014(1), pp. 459-460.

[15] Hyun. E. J., Park. E. M., Cho. M. M. H., and Kim. T. Y., 2013, "Relationship among mothers` smartphone addiction levels, maternal depression and young children`s problem behaviors", The Korean Society for Early Childhood Education, 33(5), pp. 181-205.

[16] Kim. B. Y, Ko. E. J., and Chol. H. I., 2013, "A study on factors affecting smart-phone addiction in university students : A focus on differences in classifying risk groups", Studies on Korean Youth, 24(3), pp. 67-98.

[17] Kim. D. H., Han. J. D., and Park. K. J., 2014, "The Relationships of Smartphone Addiction and Mental Health according to Exercise hours of the After-School Exercise in Elementary School Students", The Korean Journal of Elementry Physical Education, 20(2), pp. 51-64.

[18] Choi. H. S., and Chung. O. B., 2001, "The Development of an Inventory for Measuring the Parenting Self - Efficacy of Korean Mothers", Korean J. of Child Stud., 22(3), pp. 1-15.

[19] Choe. H. S., 2010, "Female international marriage immigrants' parenting self-efficacy: Focusing on Chinese, Filipinas, and Vietnamese", Fam. Environ. Res, 48(7), pp. 1-13.

[20] Kim. K. S., Kam. S., and Lee. W. K., 2012, "The Influence of Self-efficacy, Socail Support, Postpartum Fatigue and Parenting Stress on Postpartum Depression", J Korean Soc Matern Child Health, 16(2), pp. 195-211.

[21] Hyun. E. J., Cho. M. M. H., Cho. K. S., and Kim. T. Y., 2013, "A study of the relationships among mothers` smartphone addiction levels, parenting efficacy and parenting stress", The Korean Society for Early Childhood Education, 33(3), pp. 207-225.

[22] Park. Y. S., Lee. H. K., Lee. E. H., Um. Y. R., Kang. N. M., Lee. S. H., Hur. M. H., and Kim. H. W., 1998, "A Study on Pregnant Women's Fatigue", KJWHN, 4(3), pp. 429-440.

[23] Yu. M., and Kim. M. O., 2014, "The Contribution of Maternal-Fetal Attachment: Taegyo, Maternal Fatigue and Social Support during Pregnancy", Child Health Nursing Research, 20(4), pp. 247-254.

[24] Chung. M. Y., Hwang. K. H., and Cho. O. H., 2014, "Relationship between Fatigue, Sleep Disturbance, and Gestational Stress among Pregnant Women in the Late Stages", KJWHN, 20(3), pp. 195-203.

[25] Faul. F., Erdfelder. E., Buchner. A., and Lang. A.-G., 2009, "Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses", Behavior research methods, 41(4), pp. 1149-1160.

[26] National Information Society Agency, 2014, "Survey of Internet Addiction on 2013."

[27] Lee. S. M., 2004, "Socioeconomic status and the relations maternal social support, parenting efficacy, and the mothers' aspiration of their children's attainment", M.S. thesis, Ewha Womans University, Seoul.

[28] Bae. K. E., Lee. K. H., Kim. Y. H., Kim. S., Kim. H. K., and Kim. J. H., 2010. "Child-Rearing Practices and Parenting Efficacy of Marrage-Immigrant Women", J Korean Acad Child Health Nurs, 16(3), pp. 175-183.

[29] Ahn. H. L., 1985, "Experimental study of the effects of husband's supportive behavior reinforcement education on stress relief of primigravidas", Journal of Korean Academy of Nursing, 15(1), pp. 5-16.

[30] Pugh. L. C., 1993, "Childbirth and the measurement of fatigue", J Nursing Measurement, 1(1), pp. 57-66.

[31] Radloff. L. S., 1977, "The CES-D scale a self-report depression scale for research in the general population", Applied psychological measurement, 1(3), pp. 385-401.

[32] Shin. K. R., 1992, "The Correlates of Depressive Symptomatology in Korean-American Women In New York City", Ph. D. thesis, Columbia University, New York.

[33] Koh. M. S., 2009, "Discomforts, Depression and Self-care among Pregnant Korean Women", M.S. thesis, Seoul National University, Seoul.

[34] Park. H. J., and Moon. H. J., 2013, "Maternal Attachment to Infants, Depression and Social Support for Mothers with Infants and Their Effects on Parenting Efficacy", The Korean Journal of the Human Development, 20(3), pp. 81-98.

[35] Park. Y. Y., and Rha. J. H., 2003, "A Study on Childrearing Belief and Parental Efficacy", KJHE, 12(3), pp. 287-301.

[36] Kim. H. K., 1999, "A Study on the Relationship between Social Support and the Infertility Stress of Infertile Women", Korean J Women Health Nurs, 5(1), pp. 30-42.