Depression in family members of a patient with asthma: The Korean national health and nutrition examination survey 2007-2012

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<Abstract>

Objectives: We investigated whether the rate of depressive symptom is higher among family members of asthmatic patient compared to people who had no asthmatic family member. **Methods:** This study used data from the fourth and fifth Korea National Health and Nutrition Examination Survey (2007-2012). In this cross-sectional study, 15,987 men (mean age 46.4) and 20,906 women (mean age 47.4) were included. To compare the rate of depressive symptoms in individuals who had a family member with asthma and those who did not have, we analyzed data using survey logistic regression. **Results:** Diagnosed depression was reported by 3.0% of the study population, by 4.2% of asthmatic patient's family member, and by 3.0% of individuals who did not have a family member with asthma. Family members of asthmatic patient increased odds of diagnosed depression compared with those who did not had an asthmatic family member (odds ratio = 1.56, p = 0.008). **Conclusions:** To prevent depression among family members of asthmatic patient, health education for entire family of asthmatic patient need to be considered. Also, government and policy makers should give more attention to caregivers who had a family member with asthma.

Key words: asthma, depression, caregivers, mental health, Korea

Ⅰ. Introduction

Asthma is one of the most common chronic respiratory diseases, affecting approximately 300 million people worldwide (Braman, 2006). The prevalence of asthma has increased over the past few decades in the most countries(Eder, Ege, & von Mutius, 2006; Masoli, Fabian, Holt, & Beasley, 2004). In Korea, the prevalence of physician-diagnosed asthma increased from 1998 to 2008 according to results of analyzing Korea National Health and Nutrition Examination Survey Ⅰ and Ⅳ data(S. Y. Kim et al., 2013). The burden of asthma is considered as a worldwide public health problem with increasing its prevalence in adults and children.

Previous studies have reported that increased depression symptom of family caregivers of patients with chronic disease.

Among the studies, some studies have been reported the impact of asthma is not limited to patients with asthma, but affects their family members(Ryde Brandt, 1990; Singer & Floyd, 2006; Szabó, Mezei, Kővári, & Cserháti, 2010). Especially, in the children, their caregivers had a great burden and stress of caring their children, which may adversely affect their mental health(Easter, Sharpe, & Hunt, 2015; Szabó et al., 2010). On the other hand, depressive symptom of caregivers had a positive relationship with negative outcomes of child with asthma. Previous studies reported that the caregiver's mental health may affect development and outcome of the patients with asthma(Bartlett et al., 2004; Frankel & Wamboldt, 1998). However, the association between depression and the existence of a family member who had asthma has not been fully investigated in Korean population. Thus, we investigated

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whether the number of diagnosed-depression is higher amongst in family members of patients with asthma compared to those have no family member with asthma.

Ⅱ. Methods

This study used data from the fourth and fifth Korea national health and nutrition examination survey

(KNHANES IV-V, 2007-2012). The KNHANES is a national surveillance system that has been assessing the health and nutritional status of Koreans since 1998 conducted by the Korea Centers for Disease Control and Prevention. Detailed description for the data was previously reported elsewhere(Kweon et al., 2014). This nationally representative cross-sectional survey aims to collect information on socioeconomic status, health-related behaviors, quality of life, healthcare utilization, anthropometric measures, biochemical and clinical profiles for non-communicable diseases and dietary intakes of Koreans, approximately 10,000 individuals each year, with three component surveys: health interview, health examination and nutrition survey. The survey, targeting all family members older than 1 year of age, included 2,300 households in 2007, 4,600 households in 2008 and 2009, respectively, and 3800 households in 2010, 2011, and 2012, respectively. The response rate ranged from 71.2% to 82.8% (2007, 71.2%; 2008, 77.8%; 2009, 82.8%; 2010, 81.9%; 2011, 80.4%; 2012, 80.0%)(Jang et al., 2016). Our study did not require ethical committee approval, because the KNHANES data are secondary data that are available in the public domain and do not contain personal information. Among the 50,405 individuals in the dataset (22,926 males and 27,479 females), this study included 39,251 individuals aged 13 or over responded to the survey question regarding diagnosed depression (17,098 males and 39,251 females). Of those, a total of 36,893 individuals (15,987 males and 20,906 females) were included in the current study after excluding individuals who had asthma and missing important variable.

We defined the depression, using question of the physician-diagnosed depression. Diagnosed depression was assessed by using the question: "Have you ever diagnosed depression by doctor?" The dependent variable was the reported diagnosis of depression within the past year. The covariates included the survey year, gender, age, family income, education level, job, marital status, self-reported health condition, underlying chronic disease, number of family members, and sleep duration according to our preliminary analysis and previous research. The education level was categorized into four groups (graduation from university or more, graduation from high school, graduation from middle school, and graduation from elementary school). The job variable was divided into three groups (office worker, site worker, and unemployed or homemaker). The marital status was categorized into three groups (marriage with cohabitation, other types of marriage [e.g., separated], and single). Self-reported health condition was divided into three groups (good, common, and bad). Underlying disease was considered present if the respondent was diagnosed with hypertension or diabetes by a doctor. The number of family members was divided into five groups (one, two, three, four, and more than four). Sleep duration was categorized into five groups (<6 h, 6 h, 7 h, 8 h, and ≥9 h). The data analysis was conducted using the independent t-test, chi-square test, and multivariate logistic regression. Multivariate logistic regression was used to compare the rate of depressive symptoms in individuals who had a family member with asthma and those who did not have adjusting for survey year, gender, age, family income, education level, job, marital status, self-reported health condition, underlying chronic disease, number of family members, and sleep duration. Considering the complex survey sample design, survey logistic regression was adopted. Survey weights were taken into account, and adjusted odds ratios and 95% confidence intervals were calculated. The data were analyzed for the entire sample and then stratified by gender. All analyses were performed using SAS statistical software, version 9.2 (SAS Institute Inc., Cary, NC). All statistical tests were two-sided and p values less than 0.05 were considered statistically significant.

Ⅲ. Results

People who had a family member with asthma were reported by 4.0% of the total sample population (4.5% of males, 3.5% of females). Among individuals included in the current analysis, the rate of reported depression was 3.0% (1.4% of males, 4.6% of females). Mean age was 46.4 years in males and 47.4 years in females (data not shown).

<Table 1> presents the rate of for all levels of the independent variables according to the existence of a family member with asthma. Participants who had a family member with asthma had a higher distribution of male, having occupation and more family members and high prevalence of physician-diagnosed depression compared to those who did not have a family member with asthma.

<Table 1> General characteristics of study population according to the existence of a family member who had asthma

(Unit: n, %‡)

| | | Total | | Family member of asthma patient | | | | p-value |
				Yes		No		
Diagnosed depression	Yes	1,281	3.0	71	4.2	1,210	3.0	.019
	No	35,612	97.0	1,479	95.8	34,133	97.0	
Gender	Male	1,550	4.0	754	55.8	15,233	49.6	<.001
	Female	35,343	96.0	796	44.2	20,110	50.4	
Age*	Years	47.0 (18.4)		46.3 (18.7)		47.0 (18.4)		.174
Family income	4th quartile	7,067	15.8	305	18.0	6,762	15.7	.257
	3rd quartile	9,167	26.4	401	27.4	8,766	26.3	
	2nd quartile	9,944	29.1	382	25.9	9,562	29.2	
	1st quartile (highest)	10,075	28.8	441	28.8	9,634	28.8	
Education level	Elementary school	10,693	21.5	426	20.1	10,267	21.5	.616
	Middle school	4,817	13.0	216	13.8	4,601	13.0	
	High school	11,746	37.0	513	38.0	11,233	36.9	
	University or more	9,548	28.6	393	28.1	9,155	28.6	
Jobs	Office worker	10,897	35.4	482	37.6	10,415	35.3	.036
	Site worker	9,102	25.0	406	26.7	8,696	24.9	
	Unemployed or homemaker	15,250	39.6	587	35.7	14,663	39.8	
Marital status	Cohabiting marriage	24,776	62.7	1,050	60.5	23,726	62.8	<.001
	Other types of marriage	4,509	9.4	101	4.9	4,408	9.6	
	Single	7,491	27.8	396	34.6	7,095	27.5	
Self-reported health condition	Good	14,373	39.8	590	38.2	13,783	39.9	.282
	Common	15,049	42.8	616	42.6	14,433	42.8	
	Bad	7,410	17.3	340	19.2	7,070	17.3	
Underlying chronic disease[†]	Yes	11,566	24.5	483	24.1	11,083	24.5	.765
	No	25,327	75.5	1,067	75.9	24,260	75.5	
Family number	1	5,945	18.5	-	-	5,945	19.2	<.001
	2	16,128	39.8	510	30.8	15,618	40.1	
	3	8,076	22.8	501	33.1	7,575	22.3	
	4 and more	6,744	19.0	539	36.2	6,205	18.3	

		Total		Family member of asthma patient				p-value
				Yes		**No**		
Sleeping hours	Less than 6 hours	5,470	13.3	227	14.0	5,243	13.2	.665
	6 hours	9,215	26.1	402	27.1	8,813	26.1	
	7 hours	10,368	28.6	421	27.5	9,947	28.6	
	8 hours	8,360	23.3	354	23.6	8,006	23.3	
	more than 9 hours	3,193	8.7	131	7.8	3,062	8.8	
Survey years	2007	2,894	8.3	88	6.2	2,806	8.3	.506
	2008	6,577	16.7	272	15.8	6,305	16.7	
	2009	8,218	19.0	357	19.5	7,861	19.0	
	2010	6,742	18.7	309	20.8	6,433	18.6	
	2011	6,438	18.9	270	19.2	6,168	18.9	
	2012	6,024	18.5	254	18.6	5,770	18.5	
		36,893	100.0	1,550	4.2	35,343	95.8	

[*] Age is presented as mean (standard deviation)
[†] Underlying chronic disease includes hypertension, diabetes, dyslipidemia, and arthritis
[‡] Weighted percentage

<Table 2> shows the rate of reported depression for all levels of the independent variables by gender. Mean age of individuals with depression was higher than individuals reporting no depression. Among the individuals who had a family member with asthma, the rate of reported depression was 4.2% (2.2% of males, 6.7% of females). On the other hand, among the individuals who did not have a family member with asthma, the rate of reported depression was 3.0% (1.3% of males, 4.6% of females). The rate of reported depression was elevated among individuals with old age, low family income, bad health condition, chronic disease, too little sleep, and females, respectively.

<Table 3> shows the adjusted odds ratio (OR) of reported depression by each of the independent variables among the study population by gender in multivariable logistic regression model. People who had a family member with asthma had increased odds of reported depression compared with those who did not have a family member with asthma (OR = 1.56, 95% CI 1.12-2.16). When the sample was stratified by gender, the significance remained only for females (OR = 1.69, 95% CI 1.18-2.41).

Compared with the highest education levels (university or more), the other education groups had significantly higher odds of reported depression. Respondents who reported their health condition as common or bad had significantly higher odds of reported depression than those who reported their health condition as good (common: OR = 1.94, 95% CI 1.59-2.38; bad: OR = 4.29, 95% CI 3.50-5.25). Respondents who reported sleeping ≤6 h or ≥8 h had significantly higher odds of reported depression compared with those who reported sleeping 7 h. Females had significantly higher odds of reported depression than males.

<Table 2> Depression of independent variables by gender

		Total				Male				Female			
		Total	Yes	No	p-value	Total	Yes	No	p-value	Total	Yes	No	p-value
Family member of Asthma patient	Yes	1,281	4.2	95.8	.019	232	2.2	97.8	.117	1,049	6.7	93.3	.015
	No	35,612	3.0	97.0		15,755	1.3	98.7		19,857	4.6	95.4	
Age*	Years	38,887	54.2 (15.1)	46.7 (18.5)	<.001	16970	54.1 (16.4)	46.3 (18.6)	.008	21917	54.2 (14.8)	47.0 (18.4)	<.001
Family income	4th quartile	7,067	4.5	95.5	<.001	2,782	2.4	97.6	.002	4,285	6.2	93.8	<.001
	3rd quartile	9,167	3.5	96.5		3,953	1.3	98.7		5,214	5.6	94.4	
	2nd quartile	9,944	2.4	97.6		4,441	1.1	98.9		5,503	3.8	96.2	
	1st quartile (highest)	10,075	2.4	97.6		4,546	1.2	98.8		5,529	3.7	96.3	
Education level	Elementary school	10,693	4.6	95.4	<.001	3,546	2.1	97.9	.006	7,147	6.1	93.9	<.001
	Middle school	4,817	3.2	96.8		2,302	1.5	98.5		2,515	5.0	95.0	
	High school	11,746	2.9	97.1		5,345	1.3	98.7		6,401	4.6	95.4	
	University or more	9,548	1.9	98.1		4,754	1.0	99.0		4,794	3.0	97.0	
Jobs	Office worker	10,897	2.1	97.9	<.001	5,347	1.0	99.0	<.001	5,550	3.5	96.5	<.001
	Site worker	9,102	2.6	97.4		5,426	1.3	98.7		3,676	5.5	94.5	
	Unemployed or homemaker	15,250	4.4	95.6		4,332	2.3	97.7		10,918	5.4	94.6	
Marital status	Cohabiting marriage	24,776	3.2	96.8	<.001	11,341	1.3	98.7	<.001	13,435	5.2	94.8	<.001
	Other types of marriage	4,509	5.9	94.1		743	3.6	96.4		3,766	6.6	93.4	
	Single	7,491	1.5	98.5		3,843	1.3	98.7		3,648	1.8	98.2	
Self-reported health condition	Good	14,373	1.2	98.8	<.001	6,974	0.7	99.3	<.001	7,399	1.8	98.2	<.001
	Common	15,049	2.8	97.2		6,468	1.2	98.8		8,581	4.4	95.6	
	Bad	7,410	7.6	92.4		2,510	4.0	96.0		4,900	10.0	90.0	
Underlying chronic disease†	Yes	11,566	5.2	94.8	<.001	4,558	2.0	98.0	<.001	7,008	7.7	92.3	<.001
	No	25,327	2.3	97.7		11,429	1.2	98.8		13,898	3.5	96.5	
Family number	1	5,470	4.1	95.9	<.001	1,553	1.6	98.4	.106	4,392	5.4	94.6	<.001
	2	9,215	3.2	96.8		7,567	1.2	98.8		8,561	5.5	94.5	
	3	10,368	2.9	97.1		3,719	1.8	98.2		4,357	4.2	95.8	
	4 and more	8,360	1.7	98.3		3,148	1.1	98.9		3,596	2.3	97.7	
Sleeping hours	Less than 6 hours	5,470	5.6	94.4	<.001	1,997	2.0	98.0	<.001	3,473	8.3	91.7	<.001
	6 hours	9,215	2.6	97.4		4,305	0.8	99.2		4,910	4.6	95.4	
	7 hours	10,368	1.9	98.1		4,610	1.0	99.0		5,758	3.0	97.0	
	8 hours	8,360	3.0	97.0		3,629	1.6	98.4		4,731	4.3	95.7	
	more than 9 hours	3,193	3.8	96.2		1,324	3.1	96.9		1,869	4.4	95.6	
Survey years	2007	2,894	1.9	98.1	.001	1,209	1.2	98.8	.404	1,685	2.6	97.4	.002
	2008	6,577	2.7	97.3		2,775	1.0	99.0		3,802	4.4	95.6	
	2009	8,218	2.8	97.2		3,648	1.3	98.7		4,570	4.3	95.7	
	2010	6,742	3.0	97.0		2,987	1.4	98.6		3,755	4.6	95.4	
	2011	6,438	3.6	96.4		2,808	1.7	98.3		3,630	5.5	94.5	
	2012	6,024	3.4	96.6		2,560	1.5	98.5		3,464	5.2	94.8	
Sex	Male	15,987	1.4	98.6	<.001								
	Female	20,906	4.6	95.4									
Total		36,893	3.0	97.0		15,987	9.5	90.5		20,906	4.6	95.4	

* Age is presented as mean (standard deviation)
† Underlying chronic disease includes hypertension, diabetes, dyslipidemia, and arthritis
‡ Weighted percentage

<Table 3> Depression odds ratios of independent variables by gender*

		Total			Male			Female		
		OR	95% CI		OR	95% CI		OR	95% CI	
Family member of asthma patient	Yes	1.56	1.12	2.16	1.19	.60	2.34	1.69	1.18	2.41
	No	1.00			1.00			1.00		
Age	Years	1.00	.99	1.01	1.01	1.00	1.03	.99	.98	1.00
Family income	4th quartile	.92	.71	1.20	.95	.58	1.57	.90	.68	1.20
	3rd quartile	1.07	.86	1.32	.83	.53	1.28	1.12	.88	1.44
	2nd quartile	.92	.73	1.16	.93	.58	1.51	.92	.71	1.18
	1st quartile (highest)	1.00			1.00			1.00		
Education level	Elementary school	1.40	1.03	1.90	1.43	.85	2.42	1.34	.93	1.94
	Middle school	1.32	1.01	1.74	1.01	.57	1.79	1.37	.98	1.92
	High school	1.39	1.12	1.73	1.11	.71	1.72	1.42	1.10	1.83
	University or more	1.00			1.00			1.00		
Jobs	Office worker	1.00			1.00			1.00		
	Site worker	1.01	.81	1.26	1.05	.66	1.67	1.00	.77	1.30
	Unemployed or homemaker	1.32	1.09	1.61	1.40	.83	2.35	1.20	.98	1.49
Marital status	Cohabiting marriage	1.00			1.00			1.00		
	Other types of marriage	1.06	.84	1.32	2.07	1.20	3.55	1.03	.80	1.31
	Single	.67	.47	.95	1.63	.87	3.06	.48	.31	.74
Self-reported health condition	Good	1.00			1.00			1.00		
	Common	1.94	1.59	2.38	1.63	1.06	2.49	2.11	1.66	2.67
	Bad	4.29	3.50	5.25	3.97	2.59	6.08	4.48	3.51	5.70
Underlying chronic disease†	Yes	1.26	1.04	1.53	1.06	.72	1.57	1.36	1.10	1.69
	No	1.00			1.00			1.00		
Family number	1	1.44	1.08	1.94	.81	.42	1.54	1.65	1.20	2.26
	2	1.58	1.21	2.07	.97	.58	1.62	1.87	1.40	2.49
	3	1.70	1.28	2.26	1.47	.88	2.46	1.75	1.29	2.39
	4 and more	1.00			1.00			1.00		
Sleeping hours	Less than 6 hours	2.05	1.66	2.54	1.37	.82	2.29	2.31	1.82	2.93
	6 hours	1.31	1.05	1.63	.78	.48	1.26	1.55	1.21	1.98
	7 hours	1.00			1.00			1.00		
	8 hours	1.51	1.20	1.89	1.34	.83	2.18	1.55	1.21	2.00
	more than 9 hours	1.70	1.26	2.28	2.22	1.19	4.16	1.48	1.08	2.02
Survey years	2007	1.00			1.00			1.00		
	2008	1.41	.99	2.01	.79	.38	1.64	1.75	1.21	2.52
	2009	1.67	1.18	2.36	1.02	.51	2.04	2.00	1.39	2.87
	2010	1.74	1.21	2.49	1.17	.57	2.40	2.04	1.40	2.97
	2011	2.18	1.52	3.11	1.31	.66	2.59	2.63	1.81	3.83
	2012	1.96	1.37	2.81	1.17	.56	2.47	2.36	1.62	3.43
Sex	Male	.38	.31	.46						
	Female	1.00								

* Multivariate logistic regression model adjusted for other variables in the tables
† Underlying chronic disease includes hypertension, diabetes, dyslipidemia, and arthritis
Abbreviation: OR, odds ratios; CI, confidence interval

Ⅴ. Discussion

We investigated the association between depression and the existence of a family member who had asthma. According to our results of analysis, the prevalence of diagnosed depression among family member who had a patient with asthma was significantly higher than individuals who did not have a family member who had asthma. Our findings are consistent in previous studies which have reported the significant association between depression and the existence of a family member with asthma. Especially, in mothers of children with asthma, there are evidences to suggest that caregivers of children with asthma exhibit greater anxious and depressive symptoms compared with caregivers of healthy children. A previous study with asthmatic children's caregivers reported that prevalence of depression and anxiety in caregivers was higher than in the average population(Szabó et al., 2010). In the result of meta-analysis, caregivers of children with asthma had greater anxious and depressive symptom than caregivers of health children(Easter et al., 2015). Several studies have also reported that caregivers of chronically ill or disabled children had a higher rate of depression compare with caregivers of healthy children(Rudolph, Rosanowski, Eysholdt, & Kummer, 2003; Ryde Brandt, 1990; Singer & Floyd, 2006) and a significant association between asthma severity and maternal mental health(Tibosch, Verhaak, & Merkus, 2011) Tibosch, Verhaak, & Merkus, 2011). Another cross-sectional study found that the increased prevalence of psychiatric disorders, particularly depressive disorders, in caregivers were related to asthma-related hospitalizations in the children(Brown et al., 2006). Similarly, caregivers of children with epilepsy(Ferro & Speechley, 2009), cystic fibrosis(Yılmaz et al., 2008), psychotic disorders(Ryde Brandt, 1990), and speech impairments(Rudolph et al., 2003) had a higher risk of depression compare with caregivers of healthy children. Recent review article reported that parents of children with chronic illness had a greater stress than those who had healthy children(Cousino & Hazen, 2013). However, to our knowledge, few or no studies investigated depression of family members who had adult family members with asthma. Our results suggest that the existence of family member with asthma, including adult asthmatic patients (persons aged > 13 years), significantly associated with mental health of other family members after adjusting for potential confounders, particularly in women.

A previous study found that patients with asthma were about 1.5 times likely to have a comorbid depression compared with those without asthma(Yılmaz et al., 2008). On the other hand, people with depression were 3.17 times likely to have a comorbidity of asthma compared with those without depression. This study suggested that allergy related inflammatory responses may play an important role of linking asthma and depression. According to our results, patients with asthma may affect their caregiver's mental health, but the mechanism still unknown. Further research is needed to understand this finding. Caregiver depression is a complex process, influenced by several factors related to both patients and caregiver characteristics(Covinsky et al., 2003). Previous studies reported that depression of caregivers resulted from an interplay of diverse factors including characteristics of the patient and caregiver, as well as cultural factors(Donaldson, Tarrier, & Burns, 1997; Janevic & Connell, 2001; Schulz & Williamson, 1991). Because of the high prevalence of depression in caregivers, and its potential association with adverse outcomes, identifying the depression of family members who care for family members(Levine, 1999). To reduce of depression in caregivers, pharmacologic and nonpharmacologic treatments that are effective in general groups of people with depression are needed(Covinsky et al., 2003). Furthermore, interventions focused on caregiver support may reduce rates of caregiver depression and burden(Mittelman et al., 1995).

When analyzing by gender, the association was only remain in women. It might be because most commonly the primary caregiver is mother. They are usually responsible for managing their child's asthma in the home. Depression in mother of a patient with asthma may affect a patient's health outcome. A previous study found that maternal depressive symptoms significantly influence adherence to asthma medications and illness management(Bartlett et al., 2004). Identifying maternal psychological status is very important to protect their

children's asthmatic health.

In general, depression is much more common among women than men(Kessler, 2003). The higher prevalence of depression among women than men is well documented in previous studies which reported the prevalence of women was about two times that of men. In a previous study with Korean adults in National Health and Health Behavior Examination Survey, the prevalence of depression was 6.8% in males and 10.4% in females(Cho, Nam, & Suh, 1998). Another study with Korean women reported that the strong predictors of depression were income, menopausal, and marital status(Shin, Shin, Park, & Yi, 2004). The higher levels of depression in Korean women may result from a pronounced patriarchal social system holding the expectation that women should perform traditional female roles, such as that of homemaker and mother. Furthermore, Korean women in the workplace typically experience gender-based discrimination in salary and promotion(Nam & Choi, 2000).

Our study has some limitations. First, we could not confirm the temporal causal relationship between depression and the existence of a family member who had asthma due to the cross-sectional study. Second, although we controlled for several potential confounders in our statistical models, there was a possibility of residual confounding effect because we used secondary data. More longitudinal and prospective studies are needed. Third, we could not elucidate specific mechanism between depression and the existence of a family member who had asthma. Fourth, it is possible that diagnosed-depression and asthma were misclassified because we used self-reported data about diagnosed-depression and asthma. Misclassification, if any, would be expected to bias our results toward the null. Finally, it may not be appropriate to generalized it another ethnic group because this study was conducted with Koreans. Nevertheless, these findings can be generalized to the Korean general population, as the study participants were a representative population-based sample of Koreans. It is a meaningful study conducted in Korean population, considering that increasing prevalence of asthma was found in Korean population recently(Kim et al., 2014; Kim et al., 2013).

Ⅳ. Conclusion

Our findings suggest that family members with asthmatic patient had at a higher risk for depression. Identifying mental health among family members of patients with asthma is very important to improve heath of all family members because mental health of caregivers of patients with asthma may affect outcome and mental status of the patients. Multidisciplinary efforts to identify and treat depression among family members of a patient with asthma are needed to manage and focus on multiple risk factors related to depression simultaneously.

References

Bartlett, Susan J, Krishnan, Jerry A, Riekert, Kristin A, Butz, Arlene M, Malveaux, Floyd J, & Rand, Cynthia S. (2004). Maternal depressive symptoms and adherence to therapy in inner-city children with asthma. *Pediatrics, 113*(2), 229-237.

Braman, Sidney S. (2006). The global burden of asthma. *Chest Journal, 130*(1_suppl), 4S-12S.

Brown, E Sherwood, Gan, Vanthaya, Jeffress, Jala, Mullen-Gingrich, Kacy, Khan, David A, Wood, Beatrice L, . . . Rush, A John. (2006). Psychiatric symptomatology and disorders in caregivers of children with asthma. *Pediatrics, 118*(6), e1715-e1720.

Cho, Maeng J., Nam, Jung J., & Suh, Guk H. (1998). Prevalence of symptoms of depression in a nationwide sample of Korean adults. *Psychiatry research, 81*(3), 341-352.

Cousino, Melissa K., & Hazen, Rebecca A. (2013). Parenting stress among caregivers of children with chronic illness: a systematic review. *Journal of pediatric psychology, 38*(8), 809-828.

Covinsky, Kenneth E, Newcomer, Robert, Fox, Patrick, Wood, Joan, Sands, Laura, Dane, Kyle, & Yaffe, Kristine. (2003). Patient and caregiver characteristics associated with depression in caregivers of patients with dementia. *Journal of general internal medicine, 18*(12), 1006-1014.

Donaldson, Catherine, Tarrier, Nicholas, & Burns, Alistair. (1997). The impact of the symptoms of dementia on caregivers. *The British Journal of Psychiatry, 170*(1), 62-68.

Easter, Gemma, Sharpe, Louise., & Hunt, Caroline J. (2015). Systematic Review and Meta-Analysis of Anxious and Depressive Symptoms in Caregivers of Children With Asthma. *Journal of pediatric psychology*, jsv012.

Eder, Waltraud, Ege, Markus J., & von Mutius, Erika. (2006). The asthma epidemic. *New England Journal of Medicine, 355*(21),

2226-2235.

Ferro, Mark A, & Speechley, Kathy N. (2009). Depressive symptoms among mothers of children with epilepsy: a review of prevalence, associated factors, and impact on children. *Epilepsia, 50*(11), 2344-2354.

Frankel, Karen., & Wamboldt, Marianne Z. (1998). Chronic childhood illness and maternal mental health—why should we care? *Journal of Asthma, 35*(8), 621-630.

Janevic, Mary R., & Connell, Cathleen M. (2001). Racial, ethnic, and cultural differences in the dementia caregiving experience recent findings. *The gerontologist, 41*(3), 334-347.

Jang, Sung-In, Bae, Hong-Chul, Shin, Jaeyong, Jang, Suk-yong, Hong, Seri, Han, Kyu-Tae, & Park, Eun-Cheol. (2016). The effect of suicide attempts on suicide ideation by family members in fast developed country, Korea. *Comprehensive Psychiatry*.

Kessler, Ronald C. (2003). Epidemiology of women and depression. *Journal of affective disorders, 74*(1), 5-13.

Kim, Hyesook, Oh, Se-Young, Kang, Myung-Hee, Kim, Ki-Nam, Kim, Yuri., & Chang, Namsoo. (2014). Association Between Kimchi Intake and Asthma in Korean Adults: The Fourth and Fifth Korea National Health and Nutrition Examination Survey (2007-2011). *Journal of medicinal food, 17*(1), 172-178.

Kim, Song Yee, Jung, Ji Ye, Park, Moo Suk, Kang, Young Ae, Kim, Eun Young, Kim, Se Kyu, . . . Kim, Young Sam. (2013). Increased prevalence of self-reported asthma among Korean adults: an analysis of KNHANES I and IV data. *Lung, 191*(3), 281-288.

Kweon, Sanghui, Kim, Yuna, Jang, Myoung-jin, Kim, Yoonjung, Kim, Kirang, Choi, Sunhye, . . . Oh, Kyungwon. (2014). Data resource profile: the Korea national health and nutrition examination survey (KNHANES). *International journal of epidemiology, 43*(1), 69-77.

Levine, Carol. (1999). Home Sweet Hospital The Nature and Limits of Private Responsibilities for Home Health Care. *Journal of Aging and Health, 11*(3), 341-359.

Masoli, Matthew, Fabian, Denise, Holt, Shaun, & Beasley, Richard. (2004). The global burden of asthma: executive summary of the GINA Dissemination Committee report. *Allergy, 59*(5), 469-478.

Mittelman, Mary S, Ferris, Steven H, Shulman, Emma, Steinberg, Gertrude, Ambinder, Abby, Mackell, Joan A, & Cohen, Jacob. (1995). A comprehensive support program: effect on depression in spouse-caregivers of AD patients. *The Gerontologist, 35*(6), 792-802.

Nam, J. J., & Choi, E. J. (2000). *Korean women's health and policy based on nationwide survey on health and nutrition.* Paper presented at the Second Symposium of Korean Academic Society of Women's Health, Seoul.

Rudolph, Michael, Rosanowski, Frank, Eysholdt, Ulrich, & Kummer, Peter. (2003). Anxiety and depression in mothers of speech impaired children. *International journal of pediatric otorhinolaryngology, 67*(12), 1337-1341.

Ryde Brandt, Brita. (1990). Anxiety and defence strategies in mothers of children with different disabilities. *British journal of medical psychology, 63*(2), 183-192.

Schulz, Richard., & Williamson, Gail M. (1991). A 2-year longitudinal study of depression among Alzheimer's caregivers. *Psychology and aging, 6*(4), 569.

Shin, Kyung Rim, Shin, Chol, Park, Sun Young, & Yi, Hye Ryeon. (2004). Prevalence and determining factors related to depression among adult women in Korea. *J Korean Acad Nurs, 34*(8), 1388-1394.

Singer, George H. S., & Floyd, Frank. (2006). Meta-analysis of comparative studies of depression in mothers of children with and without developmental disabilities. *American journal on mental retardation, 111*(3), 155-169.

Szabó, Alexandra, Mezei, Györgyi, Kővári, Éva, & Cserháti, Endre. (2010). Depressive symptoms amongst asthmatic children's caregivers. *Pediatric Allergy and Immunology, 21*(4p2), e667-e673.

Tibosch, Marijke M, Verhaak, Christianne M, & Merkus, Peter JFM. (2011). Psychological characteristics associated with the onset and course of asthma in children and adolescents: a systematic review of longitudinal effects. Patient education and counseling, *82*(1), 11-19.

Yılmaz, Ozge, Sogut, Ayhan, Gulle, Saniye, Can, Demet, Ertan, Pelin, & Yuksel, Hasan. (2008). Sleep quality and depression-anxiety in mothers of children with two chronic respiratory diseases: Asthma and cystic fibrosis. *Journal of Cystic Fibrosis, 7*(6), 495-500.