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GENDER AND AGE DIFFERENCES IN HEALTHCARE UTILIZATION AND SPENDING AMONG THE OLDER ADULT OUTPATIENT WITH MULTIMORBIDITY

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ABSTRACT

Background and objective

An aging population and multimorbidity are our inevitable future. Multimorbidity is associated with increased healthcare utilization and costs. Little is known about sex- and age-specific healthcare utilization and spending change. A prospective cohort study and a better understanding of sex- and age-related issues and trends are needed so that necessary programs, resources allocation, and cost containment can be executed.

Material and methods

This study used data drawn from the National Health Insurance database of Taiwan and a person-based longitudinal analysis to investigate outpatients aged 55 years and older over a 10-year period.

Results

Among those with multimorbidity, the proportion of multimorbidity was higher for women than for men, especially in the 55–69 age group. There were sex and age differences in healthcare utilization/spending: overall, women had more ambulatory visits than men, but men had a higher total claims amount than women. With regard to age-specific ambulatory visits, more women were in the 55–64 age group, and their total claims amount was not higher than that of men. Men had more ambulatory visits in the 65–79 age group, and their total claims amount was higher than that of women.

Conclusions
Healthcare utilization was greater among women than men, but men had higher healthcare spending than women. There were evidently differences among age groups. Strategies regarding public health policies and appropriate interventions are urgently needed, particularly for men. It is necessary to increase men's health awareness and encourage health promotion incentives to reduce the consumption of medical resources.

Key Words: *healthcare spending; healthcare utilization; multimorbidity*

INTRODUCTION

An aging population and multimorbidity are becoming an everyday reality; they are our inevitable future. According to the World Health Organization,[1] the world's population aged 60 years or over will almost double between 2015 and 2050 from 12% to 22%. By 2050, the number of older adults will far exceed that of youth aged 14 or younger. In Taiwan, elderly people aged 65 and older will represent 20.1% of the total population by 2025 and up to 36.9% by 2050[2]; the aging index was 100.18 in 2017.[3] Therefore, the aging population is unprecedented, pervasive, and enduring, and has profound implications for many facets of human life. The 21st century will witness more rapid aging than any other century in the past.[4]

Multimorbidity has been commonly defined as two or more chronic illness in one individual.[5] A few studies found that the 1-year incidence of multimorbidity is 1.3% in the whole population, including all ages. Increasing age is the major risk factor for multimorbidity.[6] Patients with multimorbidity are considered the typical majority, not an exception to the norm.[7,8] A previous study showed that the prevalence of multimorbidity ranged from 55% to 98%.[9] Although methodological heterogeneity was the main reason for the increase, there is a clear and steady trend toward higher prevalence rates with increasing age, and multimorbidity has been found in numerous studies to be an anticipated tendency in older adults.[10]

Many studies have demonstrated a positive association among multimorbidity, healthcare utilization, and cost,[11] which incurs a disproportionate share of resources.[12] The adverse effects of multimorbidity on clinical outcomes include worsened functional status, high mortality rate,[13,14] and deteriorated quality of life and survival.[15,16] Therefore, multimorbidity is a difficult situation for patients and their families, healthcare providers,[17] and even for insurance payers.[18] To better meet their needs, it is necessary to avoid stereotypes and oversimplification, identify the necessary evidence base,[19] and research multimorbidity and its associated healthcare utilization and spending, which remain urgent issues.

Patients with multimorbidity require specific medical care. However, current clinical practices lack sufficient coordination of care and practical guidelines, resulting in unsuccessful, unfit, and unsafe healthcare and general frustration among patients and physicians.[20] Aligning health systems with the needs of older populations has been a strategic focus of the World Health Organization.[21] Improved public health and medical care in the last century have helped to prolong human life expectancy, but have also made humans vulnerable to living with multiple diseases. What should the role of public health in this century be?

The best way to face these challenges is to focus on how multimorbidity affects healthcare utilization and spending and how sex- and age-specific healthcare utilization and spending change. These issues must be tracked over time for a better understanding of sex- and age-related issues and trends so that necessary programs, resources allocation, and cost containment can be executed.

Previous studies mostly used a cross-sectional design, and there remains a need for prospective cohort studies that provide more information on the trajectory of patients with multimorbidity across all ages and sexes. To avoid subjective bias, this study used data drawn from the National Health Insurance database and a person-based longitudinal analysis to investigate outpatients aged 55 years and older over a 10-year period.

The aims of this study were (1) to compare the differences and trends in the prevalence of multimorbidity among different age groups and between the sexes and (2) to analyze the differences and trends in healthcare utilization and spending associated with multimorbidity among different age groups and between the sexes. These findings may influence the government in establishing health policies, reforming the healthcare system, and creating strategic interventions and priorities for medical resource allocation to achieve the goal of enabling older adults to live long and healthy lives.

METHODS

Data sources

The data used in this study were taken from the National Health Insurance Research Database (NHIRD) constructed by the National Health Research Institutes (NHRI). Each year, the National Health Insurance Administration, Ministry of Health and Welfare (NHIA, MOHW), collects data from the National Health Insurance (NHI) program and sorts these data into data files that include registration files and original claims data for reimbursement. These data files are deidentified by scrambling the identification codes of the patients and care providers, including medical institutions/facilities and physicians, and then sent to the NHRI to make up the original files of the NHIRD, which contains detailed medical records of all NHI-insured individuals. These are reviewed by physicians to ensure that the claims are reasonable and correct. The data are further scrambled before being released to researchers who wish to use the NHIRD and its data subsets. Each researcher is required to sign a user agreement declaring that she/he has no intention of attempting to obtain information that could potentially violate the privacy of patients or healthcare providers and to acknowledge NHIRD in publications.[22]

Sampling method

A longitudinal, person-based approach was used to investigate healthcare utilization and spending changes over 10 years for the 55 and older outpatients. According to the NHIRD, a cohort of 1,000,000 beneficiaries was randomly sampled from the NHI registry of beneficiaries from March 1, 1995 to December 31, 2000 (from a total of approximately 23,753,407 persons). A linear congruent random number generation was used to sample the cohort. Patients obtained longitudinal follow-up unless they were lost because of death or emigration, and the files were updated annually. There were no significant differences in age, sex, or expense distribution between the sample and entire population.

Study participants

The subjects analyzed in this study were 300,000 beneficiaries selected randomly from a cohort of 1,000,000. Of these individuals, 42,398 were aged 55 years and older outpatients. They obtained longitudinal follow-up from 2001 to 2011.

Study variables

The following variables were included to investigate the differences and changes in trends in healthcare utilization and spending for aged 55 years and older outpatients.

Demographics

Because of limitations related to the database, the only two demographic variables that were analyzed were age and sex. Age was stratified into the following groups: 55–59, 60–64, 65–69, 70–74, 75–79, 80–84, and 85+, to reflect the different stages over the course of life.

The inclusion criteria for a chronic condition were (1) a primary diagnosis from the International Classification of Diseases, Ninth Revision, Clinical Modification, which fell within the scope of a chronic disease covered by NHI and (2) at least 14 days of prescription drug use as an outpatient and two or more visits per year. Multimorbidity referred to the presence of two or more chronic conditions in one individual.

Ambulatory visits referred to the total number of outpatient visits within 1 year. The total claims amount was the total expense for each patient within 1 year. These variables were defined according to the NHIA.

Statistical analysis

Descriptive statistics, such as percentage and frequency, were used to investigate the distribution of the study participants' multimorbidity characteristics. A chi-square test was used to analyze the differences between sex and age. Two-way ANOVA was used to analyze sex and age influences on the number of ambulatory visits and total claims amount. Statistical significance was set at $p < 0.05$. SPSS 22.0 was used for all analyses.

RESULTS

Study participants' characteristics

Of the 42,398 study participants who were followed from 2001, there were 36,703 in 2006 and 31,239 in 2011. The number of eligible participants with multimorbidity was 24,357 in 2001, 24,735 in 2006, and 23,667 in 2011. The prevalence of multimorbidity was 57.4% in 2001, 67.4% in 2006, and 75.7% in 2011, showing an increasing trend. The distribution of characterics is shown in Table 1.

Differences and trends of multimorbidity by sex and age

A comparison of the distribution of patients with multimorbidity demonstrated significant

TABLE 1 Study Participants' Multimorbidity Characteristics

	2001		2006		2011	
	N	%	N	%	N	%
Participant	42,398		36,703		31,239	
Multimorbidity	24,357	57.4	24,735	67.4	23,667	75.7
Sex						
Male	11,675	47.9	11,692	47.3	10,816	45.7
Female	12,677	52.1	13,043	52.7	12,850	54.3
Unknown	5		0		1	
Age						
55–59	3957	16.2	4774	19.3	5674	24.0
60–64	4783	19.6	5569	22.5	6154	26.0
65–69	4746	19.5	5190	21.0	5108	21.6
70–74	4749	19.5	4640	18.8	3914	16.5
75–79	3402	14.0	2854	11.5	2014	8.5
80–84	1762	7.2	1249	5.0	656	2.8
85^{+}	958	3.9	459	1.9	147	.6

differences in sex and age. The percentage of multimorbidity was higher for women than for men. For the 55–69 age group over a 10-year period, there were more women than men, indicating an increasing trend over time. Conversely, there were more men than women in the 70–79 age group, demonstrating a decreasing trend over time (Table 2).

Association healthcare utilization and spending for multimorbidity by sex and age

Two-way ANOVA was used to analyze the differences and trends in both ambulatory visits and the total claims amount by sex and age. The results showed sex and age differences and sex–age interactions. Women had more ambulatory visits than men did. Regarding age-specific differences and trends in ambulatory visits, more women than men were in the 55–64 age group, and the same was true after 10 years. In the 65–74 age group, there were more women than men in 2001, but this gradually changed to a greater number of men in 2011. The highest mean age-specific ambulatory visits for men occurred in the 75–79 age group (mean=30.84) in 2001 and the 65–69 age group (mean=28.46) in 2011, and the highest number for women occurred in the 75–79 (mean=30.74) and 60–64 age groups (mean=27.14) (Table 3, Figure 1).

Interestingly, overall, men had a higher total claims amount than women did despite women having more ambulatory visits than men, although the number of ambulatory visits gradually changed to more men in the 65–74 age group. Trends for the highest mean age-specific total claims amount for women (mean= 26,211.04 in 60–64 age group) were one age group younger than that of men (mean= 30,674.01 in 65–69 age group) and were in line with the abovementioned trend for ambulatory visits in the 65–69 age group for men and the 60–64 age group for women in 2011 (Table 4, Figure 1).

DISCUSSION

To our knowledge, this study is the first to explore how is healthcare utilization and spending changing by sex and age among the older adult outpatient with multimorbidity.

According to the results, the prevalence of multimorbidity increased from 57.4% to 75.7%, with more women than men. The 55–69 age group

TABLE 2 Comparison of the Distribution of Multimorbidity by Sex and Age

Sex	2001			2006			2011		
	Male (%)	Female (%)	Compare	Male (%)	Female (%)	Compare	Male (%)	Female (%)	Compare
Age									
55–59	6.6	9.6	f	8.4	10.9	f	10.5	13.5	f
60–64	8.4	11.2	f	9.8	12.7	f	11.2	14.8	f
65–69	9.1	10.4	f	9.9	11.1	f	9.9	11.7	f
70–74	10.6	8.9	m	9.9	8.9	m	8.3	8.3	m
75–79	7.6	6.4	m	6.0	5.5	m	4.3	4.2	m
80–84	3.8	3.4	m	2.4	2.6	f	1.3	1.5	f
85^+	1.8	2.1	f	0.9	1.0	f	0.3	0.3	f
Sum	47.9	52.1		47.3	52.7		45.7	54.3	
X^2	275.24***			130.067***			69.69***		

****P<0.001, f, females had a higher percentage than males; m, males had a higher percentage than females.*

TABLE 3 Differences in Ambulatory Visits for Multimorbidity by Sex and Age

	Ambulatory Visit								
Sex	**2001**			**2006**			**2011**		
	Male	**Female**	**Compare**	**Male**	**Female**	**Compare**	**Male**	**Female**	**Compare**
Mean	**26.67**	**27.50**	**f***	**26.42**	**26.72**	**f***	**26.39**	**26.24**	**m***
F	8.45**			0.37			6.13*		
Age									
55–59	20.57	24.28	f*	21.32	24.18	f*	23.45	25.53	f*
60–64	22.91	25.27	f*	24.76	26.27	f*	25.76	27.14	f*
65–69	26.69	28.12	f*	27.85	28.37	f	28.46	26.89	m*
70–74	29.07	30.37	f*	29.04	28.35	m	28.14	26.40	m*
75–79	30.84	30.74	m	29.20	27.50	m*	27.23	24.74	m*
80–84	29.46	29.41	m	27.25	26.06	m	26.28	23.45	m
85+	28.97	25.88	m*	27.20	24.38	m	24.89	20.98	m
F	109.30***			52.96***			16.80***		
Sex × age *F*	7.05***			6.84***			9.60***		

$^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

f, females had a significantly higher mean score than males; m*, males had a significantly higher mean score than females.*

demonstrated the same trend. Fu et al.[23] conducted a population-based study in Taiwan, and found that among people aged 65 years or older, the prevalence of multimorbidity was 42.3–64.5%. Van Oostrom et al.[24] studied time trends and the prevalence of multimorbidity, and showed that the most substantial increase was in the 55 and older age group. Although the differences were caused by methodological heterogeneity, the tendency toward higher prevalence rates with increasing age is quite obvious, and multimorbidity in old age can be seen in almost all studies as the rule rather than the exception.[10]

Upon further investigation of sex differences, this study found that women had a higher prevalence of multimorbidity, in accordance with findings from other studies.[17,23,25,26] A potential explanation for this difference is that women have a longer life expectancy that may expose them to common risk factors for chronic diseases,[23] possibly leading them to have a relatively higher tendency to share their conditions in self-reports[27,28] and to seek healthcare at a higher rate than men. Thus, the more contact with healthcare providers women have, the higher the chance that their chronic conditions may be detected with more ease compared with men.[9,29]

However, the proportion of multimorbidity was lower for men, possibly due to influencing factors such as having masculine views,[30,31] a breadwinner role, or higher trust within families[32]; risk-taking behavior; and externalizing tasks in real life.[33] These factors lead to men disregarding the early signs of disease and the importance of preventive care,[30,34] tending to delay seeking help with a lower likelihood of having routine checkups and necessary medical care for health problems due to waiting as long as possible,[30,35] and responding later to the severity of symptoms.[36] The result of these synergistic effects is that men are less likely than women to seek healthcare, resulting in the later detection of chronic conditions and different chronic diseases in a population with multimorbidity.

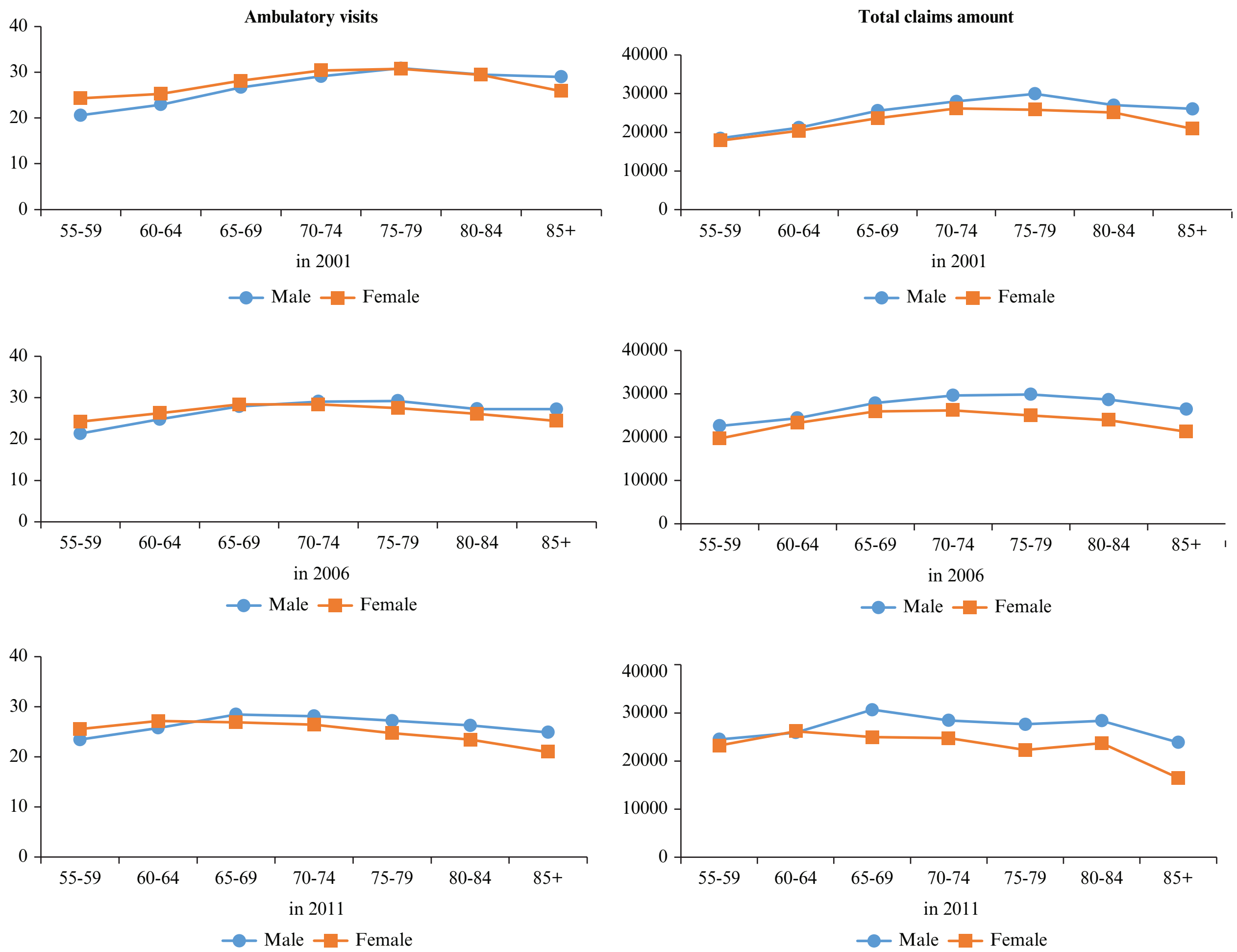

FIG. 1 Healthcare utilization and spending change by sex/age.

Women have more nonfatal, chronic conditions, but men have more fatal conditions.[33] Therefore, men had a lower ambulatory visit rate, but a higher total claim amount than women. The findings in this study showed the same result, in which women had higher multimorbidity rates and, at the same time, lower costs.

Regarding age differences, women in the 5569 age group had a higher prevalence of multimorbidity for reasons in addition to the abovementioned sex differences. Alimohammadian et al.[17] studied a population aged 40–75 years, and revealed that women in all age groups had a higher prevalence of multimorbidity. Schoenborn and Heyman[37] examined the health characteristics of adults aged 55 years and older, and found that among adults aged 55–64, women were more likely than men to have visited a doctor. However, in the 75–84 and 85 and older age groups, men and women were approximately equally as likely to have visited a doctor. These findings are also evidenced by our study, which found an age-specific difference in ambulatory visits; more women than men in the 55–64 and 65–74 age groups in 2001, which gradually shifted to more men in 2011; and no obvious differences in the 75 and older age group, such as more men than women. Men had more ambulatory visits than

TABLE 4 Differences in Total Claims Amount for Multimorbidity by Sex and Age

Total Claims Amount									
Sex	**2001**			**2006**			**2011**		
	Male	**Female**	**Compare**	**Male**	**Female**	**Compare**	**Male**	**Female**	**Compare**
Mean	**25,197.12**	**22,580.22**	**m***	**26,814.55**	**23,740.95**	**m***	**27,292.76**	**24,538.00**	**m***
F	38.26***			32.95***			11.06**		
Age									
55–59	18,459.46	17,874.71	m	22,587.55	19,626.43	m*	24,505.28	23,206.40	m
60–64	21,200.31	20,390.12	m	24,376.64	23,277.93	m	25,903.51	26,211.04	f
65–69	25,611.67	23,621.51	m*	27,827.90	25,916.09	m*	30,674.01	24,974.54	m*
70–74	28,024.81	26,224.64	m*	29,600.32	26,162.55	m*	28,432.32	24,755.42	m*
75–79	29,963.78	25,865.52	m*	29,847.76	24,969.04	m*	27,635.14	22,284.18	m*
80–84	27,045.41	25,142.71	m	28,632.68	23,894.93	m*	28,385.37	23,697.82	m
85+	26,066.63	20,958.95	m*	26,389.77	21,252.49	m*	23,867.22	16,449.23	m*
F		77.12***			23.85***			4.70***	
Sex × age *F*		2.59*			1.62			3.12**	

**p < 0.05; **p < 0.01; ***p < 0.001.*

f, females had a significantly higher mean score than males; m*, males had a significantly higher mean score than females.*

women, perhaps because older men are more open to seeking medical care than younger men are[32] and perhaps because their physical condition declines faster after retirement when they are 65 years or older than while working full-time as employees.[38] The most substantial age-specific differences in the prevalence of multimorbidity were found in the 75–79 age group, as indicated the in previous studies.[26,39] This may be because of higher utilization and greater intragroup variability with advanced age, except for the 85+ age group,[40] and because sex and age interact to shape health behaviors and experiences with health conditions.[31] In addition, trends for the highest mean age-specific ambulatory visits and total claims amount for women were one age group younger than those of men. The gap in age group may be caused by social factors related to sex: men are often unwilling and lack the motivation to engage with health-related information, and women may be more proactive and engaged in seeking and obtaining information about or discussing health-related issues.[41] Because women's perspectives and behaviors regarding healthcare cannot be easily changed, we should consider public health programs and strategic interventions to increase early diagnosis rates for men so they can be diagnosed as early as women, resulting in a decrease in medical resource consumption.

There were some limitations to this study. First, age and sex were the only two demographic variables used in the analyses. Other variables, such as region, income, and educational level, were all excluded. Second, the subjects analyzed in this study were a closed study population, some of whom may have relocated or passed away during the 10-year follow-up, so they were not counted in the statistical analysis.

Future studies may conduct further research to close gaps between our knowledge and the need for action based on evidence-based policies and to evaluate the effectiveness of initiatives to reduce the impact of multimorbidity.

CONCLUSIONS

This study provides an insight into the gender and age differences in healthcare utilization and spending among the older adult outpatient with multimorbidity. The results clearly demonstrated that there were gender and age differences. Women had a higher rate of healthcare utilization, especially in the 55–64 age group, but men had a higher spending level. Trends for the highest mean age-specific healthcare utilization and spending for women were one age group younger than those of men. Strategies regarding public health policies and appropriate interventions are urgently needed, particularly for men. It is necessary to increase men's health awareness and encourage health promotion incentives, which may reduce the consumption of medical resources.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the review board of National Taiwan University Hospital Hsin-Chu Branch.

CONFLICTS OF INTERESTS

The authors declare that they have no competing interests.

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