SUPPORT FOR CHANGES IN DAILY LIFE ACTIVITIES AND MATERNAL CARE FOR AMPUTEES IN KOREA FOR 10 YEARS

Geumbo Ko[1], Youngshin Song[2]
[1]PhD student, Department of Nursing, College of Nursing, Chungnam National University, Munwharo 266 Junggu, Daejeon, 35015 Republic of Korea, geumbogo@hotmail.com
[*2]Professor, Department of Nursing, College of Nursing, Chungnam National University, Munwharo 266 Junggu, Daejeon, 35015 Republic of Korea, yssong87@cnu.ac.kr

Abstract
Background/Objectives: This study aimed to compare the daily life activities, healthcare needs, and maternal care support between men and women with amputation for 10 years in Korea. Methods/Statistical analysis: Data were extracted and weighted from 2011 to 2020 through the National Disability Survey.
Findings: Prevalence of female amputee increased for 10 years from 16.8% to 23.3% among amputee. The activities in daily life and instrumental daily activity of female amputee have changed worse than those of men, whereas the demand for daily living support has increased over the 10 years. Women's unmet needs of healthcare have continued to increase, while their use of healthcare and regular health checkups have decreased compared to male amputee. Pregnancy and childbirth education and information showed the greatest maternal care.
Improvements/Applications: It should be provided services that meet the needs of daily life support and provide customized healthcare for maternal care in Korea.
Keywords: activity in daily life, amputation, healthcare needs, maternal care, women

1. INTRODUCTION

The consequences of amputation, including permanent damage, disability, and the onset of acute stress disorder after trauma, have been demonstrated to markedly diminish both physical and psychological aspects of one's quality of life (1). This engenders substantial alterations in one's life and functionality, resulting in permanent disability (1). Work-related injuries during amputation are particularly detrimental due to the loss of income during sick leave, in addition to medical expenses (2). Reports indicate that more than half of amputees are unable to return to their previous jobs or can only work part-time even after receiving treatment (2, 3). Amputation-induced constraints on body structure and function have implications for an individual's social involvement, with the impact varying according to their level of activity (4). Moreover, the determination of post-amputation outcomes and the sustained functionality of amputees is closely linked to personal and environmental factors (4).

In particular, several studies have shown that these factors may vary depending on gender. Previous studies reported that mobility constraints and inadequate medical services in female amputee are closely linked to the issue of health outcomes (3, 5, 6). The loss of limbs not only curtails mobility and induces physical deformities but also compromises independence, precipitating multifaceted economic, social, and psychological consequences for affected individuals (7). For example, female amputees are older than men, have more vascular diseases, experience limitations in activities of daily living (ADL), and have more limited use of prosthetics that their male counterparts (5-7). However, these research results differ depending on the socio-demographical characteristics and healthcare system of each country.

In 2020, the number of amputees in Korea was reported to be 668 per 10,000 disabled people (1). The most common cause of amputation is known to be accidents in Korea (1). The majority of amputation were men, but the proportion of women was reported to be gradually increasing. However, gender differences in activities of daily living (ADLs) or healthcare needs (e.g., maternal care) after amputation in Korea are unknown. In addition, women need more support for maternal care during pregnancy, childbirth, and childcare, depending on their life cycle, but there is insufficient data specifically for female amputees. Successful health outcomes in women with amputation require the provision of healthcare services and the development of services that meet the needs of users. For this purpose, the Korean government conduct the national survey the type of disability, health status, and welfare status of the disabled every three years. Therefore, the purpose of this study was to investigate the gender differences regarding ADLs, healthcare needs, and maternal care needs of female amputees for 10-year in Korea, and to highlight areas requiring support. Specifically, the study aims to analyze trends in the prevalence and annual rates of ADLs, healthcare needs between male and female amputee for the years 2011, 2014, 2017, and 2020. Moreover, we aimed to analyze the types and rates of maternal care needs over the past 10 years.

2. Materials and Methods

2.1. *Study Design and data source*

Study design was the cross-sectional, descriptive secondary data analysis. A stratified, multistage cluster sampling design was used to collect data from the NSCP survey. The weighted data utilized in this study were extracted from the National Survey on Disabled Persons (NSDP) conducted in Korea between 2011 and

2020. The NSDP, which has been conducted jointly by the Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs since 1980, operates in compliance with the Welfare of Persons with Disabilities Act, as outlined in Articles 31 of the Act and Articles 18 to 19 of its Enforcement Decree. Following the law's revision in 2007, this survey has been conducted triennially (8). The NSDP's sampling framework, which involves interviewing and investigating representative samples of disabled individuals living in households, serves as a reliable gauge of the health status of this population. Representative samples are drawn from the national registration census every three years. To represent Koreans with disabilities, sampling weights were applied to the data, which weighted the sample for the disabled and reflected the sampling fraction. The study utilized data from the years 2011 (weighted N = 2611126), 2014 (weighted N = 2646064), 2017 (weighted N = 2580340), and 2020 (weighted N = 2622950). Of the total data for each year, only those with amputations were extracted.

2.2. *Measurements*

2.2.1. Amputees

In medical terminology, amputation refers to the loss of a body part due to various causes. Consequently, individuals with amputation disabilities encompass those who have experienced such loss, irrespective of the reason (8). Amputation was classified into upper and lower limbs, and the upper limb and the lower limb were divided into three levels “above the elbow, between the elbow and wrist, and below the wrist” and “above the knee, between the knee and ankle, and below the ankle,” respectively, according to the amputation level. This study exclusively focuses on the extraction and analysis of amputation-related data. Specifically, the data underwent comparative analysis across four distinct time points: 2011, 2014, 2017, and 2020.

2.2.2. Activity in Daily Life (ADLs)

The ability to perform basic daily life movements is a crucial area for determining the degree of disability or the need for physical activity support for individuals with disabilities (8). The Activities of Daily Living (ADL) index, which measures daily life ability, has been one of the most widely used tools worldwide since it was suggested by Ford Katz in 1963 (9). It evaluates basic functions necessary for daily life, such as eating, using the bathroom, and bathing. In this study, respondents were asked, "To what extent can you perform the following daily movements on your own?" This question consists of 12 items: changing clothes, bathing, mouth cleaning, feeding oneself, eating, changing posture while lying down, moving, maintaining a non-sitting posture, walking, moving around, defecating, and urinating. The scale uses a four-point scale and is divided into categories of no need for support, some support, considerable support, and full support. The analysis concentrated on these 12 items, specifically including only those that do not require support, with subsequent data stratification by gender for detailed examination.

2.2.3. Instrumental ADLs (IADLs)

Instrumental Activities of Daily Living (IADL) extend beyond basic daily movements, serving as a gauge of one's capacity to independently execute tasks demanding problem-solving acumen, social adeptness, and interactions within their environment (8). IADLs encompasses eight categories: making phone calls, purchasing goods, meal preparation, household cleaning, laundry, medication management, financial management, and utilizing public transportation. Similar to ADL, the scale employs a four-point rating system, delineated into categories of no support, some support, considerable support, and full support. In the course of analysis, data pertaining to these eight components were segregated by gender, selectively incorporating solely those activities where independent execution is feasible and support is unnecessary.

2.2.4. Healthcare Needs

Healthcare needs consist of unmet healthcare needs, healthcare utilization, and regular health check-up. Unmet healthcare needs occur when there is a requirement for medical care to address a specific health issue, yet such care is either not provided, insufficiently administered, or considered inappropriate by the recipient (10). In the context of this research, unmet healthcare needs are defined as the subjective perception of inadequate healthcare reported by respondents in a survey. Specifically, the classification of unmet healthcare needs is based on respondents answering "Yes" to the query, "Have you experienced difficulty accessing hospital services in the past year? Respondents who indicated unmet healthcare needs were requested to specify the primary reasons, comprising economic constraints, difficulties in accessing medical facilities, and the perceived mildness of symptoms. The healthcare utilization aspect is based on the response of "no" to the question "Do you currently receive regular and continuous care (at least once a year) for treatment, rehabilitation, and healthcare?" In the context of this study, regular health checkups were evaluated based on respondents answering "No" to the question "Have you had a health check-up in the last two years (2018.9~2020.8)?" in the survey.

2.2.5. Maternal care needs

The maternal experience of women extends beyond the physiological events of pregnancy and childbirth, encompassing diverse relationships and personal significances (Seo, 2016). Previous studies have highlighted the increasing importance of maternal care for women with physical disabilities (Blair, 2022). In South Korea, for the first time, a survey conducted in 2005 addressed the actual conditions of disabled individuals, treating women with disabilities as a distinct category. In this study, women with disabilities were queried about the services they deemed most necessary concerning childbirth and child-rearing. Respondents were asked about 16 items, including education and information provision related to pregnancy and childbirth, as well as hotline services concerning pregnancy and child-rearing.

2.3. *Data analysis*

To compare the proportion of estimated prevalence of amputee by gender over the 10 years, descriptive statistics (frequency, percentage, mean, and standard deviation) was performed. The scores of ADLs and IADLs was compared between men and women with amputation in each year (2011, 2014, 2017, and 2020) using independent t-test. The proportion of healthcare needs and maternal care needs by gender were analyzed using Chi-square test. Statistically significant at less than 0.05. was applied in this study. Obtained data were analyzed using IBM SPSS Statistics 26.

3. Results

As shown in Table 1, in 2011, an estimated 166,893 amputees were recorded, which increased to 190,122 in 2014 before decreasing to 171,553 in 2017. By 2020, the number of amputees had slightly risen to 175,315. Moreover, the distribution of amputees by gender showed consistent patterns. Across all years, men accounted for the majority of amputees, ranging from 76.7% in 2020 to 83.7% in 2014. Conversely, women constituted

a smaller proportion of the amputee population, fluctuating from 16.3% in 2014 to 23.3% in 2020. The mean age of male amputees slightly increased from 55.6 in 2011 to 61.2 in 2020, while for female amputees, it increased from 56.1 in 2011 to 67.2 in 2020.

Table 1. Proportions of characteristics of male and female amputee for 10-year

	Year	2011 n (%)	2014 n (%)	2017 n (%)	2020 n (%)
Number of amputee	(Weighted)	166,894	190,122	171,553	175,315
Sex	Men	138,796 (83.2)	159,091 (83.7)	138,992 (81.0)	134,548 (76.7)
	Women	28,098 (16.8)	31,031 (16.3)	32,561 (19.0)	40,767 (23.3)
Age, year	Men, mean (±SD)	55.6 (± 12.66)	58.2 (± 12.60)	60.3 (± 11.9)	61.2 (± 12.14)
	Women, mean (±SD)	56.1 (±17.72)	62.1 (± 15.72)	64.9 (± 12.40)	67.2 (± 11.73)
Upper limb amputation	Men	112,090 (83.9)	131,969 (88.4)	115,351 (81.9)	99,000 (78.9)
	Women	21,573 (16.1)	17,280 (11.6)	25,216 (18.1)	26,457 (21.1)
Lower limb amputation	Men	26,706 (80.4)	27,122 (66.4)	23,641 (77.0)	35,548 (71.3)
	Women	6,526 (19.6)	13,751 (33.6)	7,045 (23.0)	14,310 (28.7)
Having chronic disease	Men	63,210 (80.0)	92,511 (79.8)	89,964 (76.6)	81,970 (72.4)
	Women	15,845 (20.0)	23,448 (20.2)	27,425 (23.4)	31,319 (27.6)

The prevalence of upper limb amputations in men remained consistently higher than that in women from 2011 to 2020, with rates ranging from 78.9% to 88.4% for men and 11.6% to 21.1% for women, suggesting a greater prevalence of upper limb amputations among men compared to women. The distribution of lower limb amputation cases among men and women generally ranged from 66.4% to 80.4% in men and from 19.6% to 33.6% in women. While the disparity has diminished over the course of several years, the prevalence of lower limb amputation remains consistently higher in males compared to females.

The prevalence of chronic diseases among both male and female amputees increased over the decade. In 2011, 80.0% of male amputees and 20.0% of female amputees were afflicted with chronic diseases, with these numbers rising to 72.4% for men and 27.6% for women by 2020. This trend indicates a substantial burden of chronic diseases among amputees, with men consistently exhibiting a higher prevalence compared to women over the study period.

Table 2. Changes of ADL and IADL score and support for 10-year

	Year	2011	2014	2017	2020
Dependent ADL level	Men	12.47 (± 2.26)	12.82 (± 2.75)	12.95 (± 3.18)	13.22 (± 4.59)
	Women	12.27 (± 1.05)	13.12 (± 2.70)	14.28 (± 4.25)	13.43 (± 4.87)
	t-value	23.24*	17.90 *	53.35*	7.64*
Dependent IADL level	Men	8.91 (± 3.02)	9.69 (± 4.07)	9.60 (± 3.66)	9.53 (± 4.06)
	Women	8.75 (± 2.30)	9.94 (± 3.88)	11.10 (± 5.07)	10.27 (± 4.49)
	t-value	10.10*	10.37*	50.51*	29.60*
Needs for daily support ('Yes' answer)	Men	N/A	24183 (80.3%)	20787 (69.4%)	16481 (67.7%)
	Women	N/A	5917 (19.7%)	9184 (30.6%)	7849 (32.3%)
	χ^2-value	N/A	291.43*	3211.91*	1284.18*
Having daily support person	Men	N/A	37383 (79.9%)	34694 (74.0%)	29892 (76.3%)
	Women	N/A	9423 (20.1%)	12172 (26.0%)	9291 (23.7%)
	χ^2-value	N/A	791.76*	2583*	11.74*

* p<.001, N/A: Not available

The findings suggest an overall increase in dependence on assistance for both basic and instrumental daily activities among both men and women over the 10-year period. Despite a slight decrease in the proportion of individuals requiring daily support and having a designated support person, a significant portion of the population still relies on assistance for their daily needs. Both men and women showed an increase in their Dependent ADL scores over the 10-year period. For men, the mean scores rose from 12.47 in 2011 to 13.22 in 2020, with standard deviations increasing from ±2.26 to ±4.59. Similarly, for women, the mean scores increased from 12.27 in 2011 to 13.43 in 2020, with standard deviations rising from ±1.05 to ±4.87.

These findings indicate an overall trend towards a higher level of dependence on assistance for basic daily activities among both genders. Similar to Dependent ADL scores, both men and women exhibited an increase in their Dependent IADL scores over the 10-year period. For men, the mean scores increased from 8.91 in 2011 to 9.53 in 2020, with standard deviations ranging from ±3.02 to ±4.06. For women, the mean scores increased from 8.75 in 2011 to 10.27 in 2020, with standard deviations ranging from ±2.30 to ±4.49. These results suggest a

growing reliance on assistance for more complex daily tasks among both genders. The prevalence of men among individuals requiring daily assistance declined from 2014 to 2020, while the proportion of women increased significantly from 19.7% in 2014 to 32.3% in 2020, marking a noteworthy trend. Moreover, the prevalence of individuals with a designated daily support person decreased for both men and women over the same period. In 2014, 79.9% of men and 20.1% of women had a daily support person, whereas by 2020, these figures had decreased to 76.3% for men and 23.7% for women.

Table 3. Changes of healthcare needs for 10-year

	Year	2011	2014	2017	2020
Unmet healthcare needs	Men	17864 (83.9%)	23531 (71.4%)	18297 (70.7%)	38341 (75.5%)
	Women	3436 (16.1%)	9438 (28.6%)	7586 (29.3%)	12464 (24.5%)
	χ^2 -value	8.65 (p = 0.003)	4422.02*	2114.66*	65.62*
Continuous healthcare utilization (‘No’ answer)	Men	77059 (87.0%)	68597 (87.4%)	46923 (93.0%)	48431 (88.2%)
	Women	11487 (13.0%)	9845 (12.6%)	3545 (7.0%)	6449 (11.8%)
	χ^2 -value	2010.67*	1390.37*	6646.67*	5922.64*
Regular health check-up (‘No’ answer)	Men	33601 (89.6%)	33188 (87.5%)	28410 (88.2%)	31420 (79.6%)
	Women	3911 (10.4%)	4746 (12.5%)	3784 (11.8%)	8077 (20.4%)
	χ^2 -value	3073.89*	536.52*	1345.83*	224.60*

* p<.001

Table 3 presents a comprehensive overview of changes in healthcare needs over a decade, spanning from 2011 to 2020. In 2011, 17,864 men (83.9%) and 3,436 women (16.1%) report unmet healthcare needs. Subsequent years exhibit fluctuations, with men reporting 23,531 (71.4%) in 2014, 18,297 (70.7%) in 2017, and 38,341 (75.5%) in 2020, and women reporting 9,438 (28.6%) in 2014, 7,586 (29.3%) in 2017, and 12,464 (29.0%) in 2020. In terms of continuous healthcare utilization, a consistent trend emerges. In 2011, 77,059 men (87.0%) and 11,487 women (13.0%) report no continuous healthcare utilization, figures that remain relatively stable for men until 2017, with 93.0% reporting no continuous healthcare utilization, while women's responses decrease to 7.0% in 2017 and increase to 11.8% in 2020. Similarly, concerning regular health check-ups, comparable patterns are observed. In 2011, 33,601 men (89.6%) and 3,911 women (10.4%) report no regular check-ups, a trend maintained until 2017, when the percentage of men reporting no regular check-ups decreases to 79.6%, and women reporting the same increase to 20.4% by 2020. Chi-squared values are significant across all years, indicating substantial trends.

Table 4. Changes of maternal care support for 10-year

Maternal care	2011, %	2014, %	2017, %	2020, %
Pregnancy and childbirth education and information provision	6.7	11.9	39.1	-
Pregnancy, childbirth, and childcare hotline service	18.1	12.1	19.6	-
Support for childbirth expenses	12.5	28.9	34.8	-
Specialized hospitals for pregnant women with disabilities	17.1	8.1	3.7	-
Postpartum care service	7.2	12.8	-	-
Rental of childcare items	-	-	-	-
Childcare support service	4.5	20.3	-	25.6
Child education assistant	1.6	-	-	52.0
Housekeeping assistant	20.5	5.9	2.7	-
Activity support worker (activity assistant)	2.8	-	-	-
Health management program	1.6	-	-	-
Counseling service (psychological and emotional)	7.4	-	-	-
Support groups (mentors)	-	-	-	-
Support for learning and talent development outside of school education	-	-	-	-
Providing information on women's products considering disabilities	N/A	N/A	N/A	22.4
Total	100.0	100.0	100.0	100.0

N/A: Not available

Table 4 depicts the evolution of maternal care support over a decade, from 2011 to 2020. There has been a substantial increase in the demand for educational services related to pregnancy and childbirth among women with amputations, rising from 6.7% in 2011 to 39.1% in 2017, underscoring their pronounced need in this area. Despite fluctuations, the provision of pregnancy, childbirth, and childcare hotline services has emerged as a pivotal resource, maintaining a notable rate of 19.6% in 2017. The category of child education assistants has experienced a significant surge in demand, climbing from 1.6% in 2011 to an impressive 52.0% in 2020, indicating a heightened requirement for support in this aspect. Moreover, there has been an upward trajectory in the necessity for assistance with childbirth expenses, with the percentage escalating from 12.5% in 2011 to 34.8% in 2017, indicating a growing need for financial support in this area. The category of Housekeeping assistant is significant at 20.5% in 2011, but decreases over the years, suggesting a potential change in domestic support services. Information on women's products considering disability accounts for 22.4% in 2020, indicating a growing need in this area.

4. Discussion

The finding from this study showed that the proportion of female amputee among person with amputation increased from 11.8% in 2011 to 23.3% in 2020. The mean age of female amputees is increasing rapidly compared to men, and amputations of their lower limbs are increasing over the 10 years. These findings are similar to previous studies showing that the proportion of older women increases as the cause of amputation increases due to accidents (1, 7). The functional mobility limitations of lower limb amputations are higher than those of the upper limbs, thus health requirements increase, but healthcare utilization decreases (7, 11).

Studies commonly have reported that this vicious cycle ultimately has a negative impact on health outcomes (3). In this study, the level of ADLs and IADLs were worse for female amputees compared to men over the 10 years. While the dependent ADLs score of male amputees increased from 12.47 to 13.22 points over the past 10 years, that of women increased from 12.27 to 13.43 points, and women's score in 2017 was the highest at 14.28 points. Changes in dependent IADLs score patterns were also similar to ADLs. These trend toward highly dependent ADLs and IADLS were in line with the high needs for assistance with daily living. In particular, women's needs for daily living support increased, while men's demand decreased. The Korean government operates a support service system for daily living, housework, and hygiene care depending on the income level of the disabled. Compared to women with amputation, men are more likely to receive government or family support to help with daily living. These inequalities may be related to differences in disease presentation or unequal access to high-quality prevention and healthcare accessibility (5). Healthcare needs generally refer to healthcare services desired by the patient or deemed necessary by healthcare providers (12). The escalating issue of unmet healthcare needs has garnered global attention. In essence, when patients perceive a deficit in the provision of medical care necessary to alleviate their health concerns, encompassing both physical and mental health issues, their medical requirements remain unfulfilled (12). The majority of studies reported higher rates of health care utilization among women than among men (12, 13). However, increasing women's use of services does not mean that their needs will be met. Previous studies have also shown higher morbidity rates in women, reflecting their greater need for services than men (12, 13). In this study, the proportion of male amputees with chronic diseases decreased, while the proportion of female amputees gradually increased over the past 10 years. The tendency for women to use more services may reflect differences in their health situation and perceptions about health (13).

On the other hand, gender differences in access to health services may be related to reproductive biology and gender-specific conditions. Female amputees during the life cycle of pregnancy and childbirth may be considered to have this condition. In Korea, support for childbirth costs and childcare support is provided to women with disabilities. As a result of a 10-year survey on the needs for maternity care services, recent changes have emerged. That is, while there was a high need for information and education on pregnancy, childbirth and childrearing from 2011 to 2017, the 2020 survey showed a high demand for practical childcare support services and child education assistant. This is interpreted as a result that reflects the need for childcare support for female amputees and the difficulties in childcare education. In fact, since 2020 was a time when there were restrictions on healthcare use and activities due to the COVID-19 pandemic, the results need to be interpreted cautiously. In a study by Bok and Song, in 2020, chronic disease care was inappropriate and regular health checkup was low in Korean person with amputation (1). Continuous monitoring is needed to ensure that these changes in maternal care needs are temporary. There is a burgeoning scholarly interest in the population most susceptible to unmet healthcare, particularly individuals with disabilities, whose unmet medical needs typically surpass those of their non-disabled counterparts. Within this demographic, the paucity of research pertaining to female amputees is conspicuous, necessitating further investigation.

This study has several limitations due to the analysis of secondary data. Due to the lack of maternal care and obstetrics and gynecology information on female amputees, it was not possible to present the child care patterns or obstetrics and gynecology management of this group. Second, because it consisted of cross-sectional data for each survey period, changes in longitudinal health behavior could not be confirmed. Third, in the case of 2020 due to the impact of COVID-19 pandemic, there may be variables affected by the isolation of amputees or low receipt of medical services. Therefore, re-identification through data analysis in 2023, three years later, may be necessary.

5. Conclusion

Over the past 10 years, the increase rate of female amputees has been higher than that of men, and the level of daily living activities of these female amputees has also been shown to have worsened. The low healthcare utilization rate and high unmet healthcare needs among female amputees are presumed to be due to aging, increased chronic diseases, and increased lower limb amputation rates. In particular, considering that opinions and priorities regarding maternal care support have changed over the past 10 years, policies on child care and education support are needed. Although this study has limitations in that it is a secondary data analysis study using national data, it is meaningful to compare the difference in gender over 10 years among amputees in Korea.

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