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Monthly Variation in Bell's Palsy Based on Population Data of Korea

Junhui Jeong[a] Jae Ho Chung[b] Soorack Ryu[c] Jong Dae Lee[d] Jin Kim[e] Ho Yun Lee[f] Chan Il Song[g] Young Sang Cho[h] Se A Lee[d] Beomcho Jun[i]

[a]Department of Otorhinolaryngology, National Health Insurance Service Ilsan Hospital, Goyang, South Korea; [b]Department of Otorhinolaryngology-Head and Neck Surgery, Hanyang University College of Medicine, Seoul, South Korea; [c]Biostatistical Consulting and Research Lab, Medical Research Collaborating Center, Hanyang University, Seoul, South Korea; [d]Department of Otorhinolaryngology-Head and Neck Surgery, Soonchunhyang University Bucheon Hospital, Soonchunhyang University College of Medicine, Bucheon, South Korea; [e]Department of Otorhinolaryngology-Head and Neck Surgery, Dongtan Sacred Heart Hospital, Hallym University College of Medicine, Hwaseong, South Korea; [f]Department of Otolaryngology-Head and Neck Surgery, Ewha Womans University College of Medicine, Seoul, South Korea; [g]Department of Otorhinolaryngology, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, South Korea; [h]Department of Otorhinolaryngology-Head and Neck Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea; [i]Department of Otorhinolaryngology, Uijeongbu St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Uijeongbu, South Korea

Keywords
Bell's palsy · Incidence · Monthly variation · Season · Population-based study

Abstract

Introduction: Several studies have reported that the number of patients with Bell's palsy varied significantly by month and season. However, few studies have reported the monthly variation in Bell's palsy based on the whole population. We investigated the monthly variation in Bell's palsy in Korea during a long-term period based on whole population data. ***Methods:*** This retrospective study used the data of the National Health Insurance Service of Korea, which included the entire Korean population from 2008 to 2020. The monthly incidence of Bell's palsy per 100,000 was evaluated in total and according to sex, age, and residence. ***Results:*** The total average monthly incidence differed significantly by month, with the highest observed in January (9.1 per 100,000) and the lowest in June (7.7 per 100,000) ($p < 0.001$). The average monthly incidence according to sex, age, and residence also varied significantly by month, with most of the highest values noted in January and the lowest in June. ***Conclusion:*** There was significant monthly variation in the incidence of Bell's palsy, with the highest in January during the winter and the lowest in June during the summer, based on whole population data over a long-term period in Korea.

Introduction

Bell's palsy is an acute idiopathic paresis or paralysis of the peripheral facial nerve [1, 2]. It is the most common cause of peripheral facial palsy [1–4]. The annual incidence of Bell's palsy has been reported to range from 11.5 to 53.3 per 100,000 [1, 2, 5–7].

karger@karger.com
www.karger.com/aud

Correspondence to:
Beomcho Jun, otojun@catholic.ac.kr

The etiology of Bell's palsy remains unclear [1, 2, 5, 8–12]. However, it has been attributed to reactivation of latent herpes simplex virus type 1 (HSV-1) infection in the geniculate ganglion [1–3, 9, 11, 13]. Ischemia and autoimmune reaction have also been thought to be causes [1, 2]. Viral reactivation could be triggered by respiratory infections, which occur more commonly during the cold season [11]. Several studies have reported that the number of patients with Bell's palsy was significantly different among months and seasons, with a trend of higher incidence in the winter [3, 11]. However, few studies regarding the monthly variation in Bell's palsy based on the whole population have been conducted.

In Korea, the national health care system consists of conventional medicine and traditional Korean medicine, and both are covered by the National Health Insurance Service. It was reported that the proportion of patients who used traditional Korean medical service was higher than those who used conventional medical service in Bell's palsy in Korea [2]. Thus, patients who used a traditional Korean medical service should be included in the analysis of Bell's palsy incidence in Korea. In this study, we investigated the monthly variation in Bell's palsy in Korea during a long-term period based on whole population data, including not only patients who used conventional medical service but also those who used traditional Korean medical service.

Materials and Methods

Subjects

This retrospective study used data from the National Health Insurance Service of Korea, which included the whole population from 2008 to 2020. All Korean people are obligated to join the National Health Insurance Service. Thus, the results of this study are based on the entire population of Korea. Patients who visited the outpatient clinic twice or more or had one or more admissions with steroid medication (medical service) or procedures such as acupuncture, moxibustion, cupping, and meridian treatment (Korean medicine) under the diagnostic codes for Bell's palsy in the International Classification of Diseases (G51.0) were defined as patients with Bell's palsy for accuracy. The Institutional Review Board of the author's institution approved this study (UC21ZISI0104). Written informed consent was exempted given the retrospective nature of the study.

Data Analysis

The monthly incidence per 100,000 was calculated using the number of patients with Bell's palsy and the monthly population of Korea. The monthly incidence from 2008 to 2020 was evaluated in total and according to sex, age, and residence. The difference in monthly incidence was analyzed using a multivariable generalized linear model for Poisson distribution in total and according to sex, age, and residence. Statistical analysis was performed using SAS 9.4 (SAS Institute, Cary, NC, USA).

Results

There were 307,149 patients with Bell's palsy who used medical service first and 662,163 patients with Bell's palsy who used traditional Korean medical service first in this study. The average monthly incidence in total and according to sex, age, and residence is described in Table 1. In Korea, spring is composed of March, April, and May; summer is composed of June, July, and August; autumn is composed of September, October, and November; and winter is composed of December, January, and February. The average monthly incidence in total varied significantly among months, with the highest in January (9.1 per 100,000) and the lowest in June (7.7 per 100,000) ($p < 0.001$). The average monthly incidence according to sex was also significantly different among months, with the highest in January (8.8 per 100,000 in males and 9.4 per 100,000 in females) and the lowest in June (7.2 per 100,000 in males and 8.2 per 100,000 in females) in both males ($p < 0.001$) and females ($p < 0.001$) (Fig. 1). The average monthly incidence according to age was also significantly different among months, with most of the highest values noted in January and lowest in June ($p < 0.001$ for all the age groups) (Fig. 2). The difference between the highest and the lowest average monthly incidence was larger in patients aged 60 or older than in patients aged 59 or younger. The average monthly incidence according to residence was also significantly different among months, with most of the highest values noted in January and the lowest in June ($p = 0.005$ for Ulsan and $p < 0.001$ for the other residences) (Fig. 3).

Discussion

There have been controversies about the monthly or seasonal variation of Bell's palsy. In a study with 1,701 patients with Bell's palsy in Denmark, there was no seasonal variation or clustering [8]. It was reported that there was no difference in the incidence according to season in a study with 2,473 patients with Bell's palsy from the UK [9]. Further, in a study with 822 pediatric patients with Bell's palsy in the USA, there was no seasonal pattern observed [5].

However, there have been more studies reporting monthly or seasonal variation in Bell's palsy than those reporting no seasonality. Bell's palsy rates were reported

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Table 1. The average monthly incidence of Bell's palsy in total and according to sex, age, and residence

Incidence per 100,000	January	February	March	April	May	June	July	August	September	October	November	December	*p* value[1]
Total	9.10	8.21	8.57	8.14	8.06	7.69	8.02	8.03	7.87	8.44	8.11	8.44	<0.001
Sex													
Male	8.79	7.93	8.12	7.67	7.66	7.15	7.47	7.58	7.49	8.04	7.83	8.18	<0.001
Female	9.40	8.50	9.01	8.61	8.46	8.23	8.57	8.49	8.26	8.84	8.39	8.71	<0.001
Age, years													
≤19	2.07	1.73	1.48	1.27	1.44	1.28	1.39	1.66	1.48	1.64	1.64	1.71	<0.001
20–29	4.69	4.07	4.15	3.80	3.83	3.52	3.82	3.87	3.89	4.42	4.14	4.49	<0.001
30–39	6.74	6.15	6.38	6.08	6.27	5.91	6.11	6.12	6.08	6.67	6.50	6.70	<0.001
40–49	8.87	8.06	8.59	8.48	8.41	7.97	8.09	8.22	8.23	8.72	8.46	8.69	<0.001
50–59	13.64	12.75	13.35	12.85	12.36	11.94	12.48	12.47	12.23	12.77	12.20	12.58	<0.001
60–69	18.86	16.63	17.50	16.42	15.67	15.38	16.10	15.64	15.30	16.16	15.51	16.55	<0.001
70–79	21.81	19.81	20.82	19.48	19.03	18.17	18.96	18.35	17.93	18.96	18.02	18.94	<0.001
80≤	19.98	17.26	18.15	17.39	17.60	16.26	16.75	16.48	15.42	16.49	15.08	15.17	<0.001
Residence													
Seoul	9.00	8.18	8.62	8.24	8.24	7.78	8.21	8.10	8.03	8.44	8.25	8.35	<0.001
Busan	9.33	8.35	9.15	8.56	8.40	8.41	8.62	8.69	8.89	8.96	8.56	8.66	<0.001
Daegu	8.42	7.48	7.81	7.59	7.53	7.20	7.60	7.69	7.45	8.25	7.78	8.16	<0.001
Incheon	9.24	8.05	8.69	8.37	8.33	7.81	7.94	7.92	8.21	8.39	8.37	8.34	<0.001
Gwangju	8.44	7.21	7.96	6.84	7.26	6.91	7.26	7.45	7.06	7.89	7.60	7.32	<0.001
Daejeon	9.03	8.71	8.36	8.45	8.32	7.87	8.04	8.27	7.80	8.66	8.32	8.76	<0.001
Ulsan	7.59	7.27	7.51	7.32	6.84	7.35	7.02	7.12	6.97	7.51	7.52	8.15	0.005
Gyeonggi	8.68	7.98	8.21	7.83	7.95	7.40	7.74	7.74	7.52	8.05	7.71	8.04	<0.001
Gangwon	9.61	8.53	8.83	8.45	7.99	7.71	8.20	8.23	7.87	8.71	8.01	8.65	<0.001
Gyeongnam	8.71	7.63	7.94	7.37	7.53	7.27	7.49	7.75	7.12	8.14	7.80	7.99	<0.001
Gyeongbuk	9.52	8.45	8.53	8.40	7.96	7.81	8.00	7.91	8.13	8.43	7.80	8.83	<0.001
Chungnam	10.69	9.50	9.74	8.92	8.85	8.27	8.68	8.43	8.38	9.30	8.61	9.44	<0.001
Chungbuk	9.91	9.13	9.55	8.90	8.51	8.02	8.40	8.43	8.13	9.04	8.65	9.19	<0.001
Jeonnam	10.26	9.15	9.39	8.75	8.51	7.74	8.65	8.66	8.42	9.29	9.07	9.32	<0.001
Jeonbuk	10.16	8.95	9.55	8.92	8.34	8.29	8.53	8.85	8.37	9.03	8.66	9.79	<0.001
Jeju	8.73	8.54	8.59	8.17	6.96	7.66	8.26	7.94	7.67	8.79	8.62	9.10	<0.001

[1]The difference in monthly incidence was analyzed using a multivariable generalized linear model for Poisson distribution.

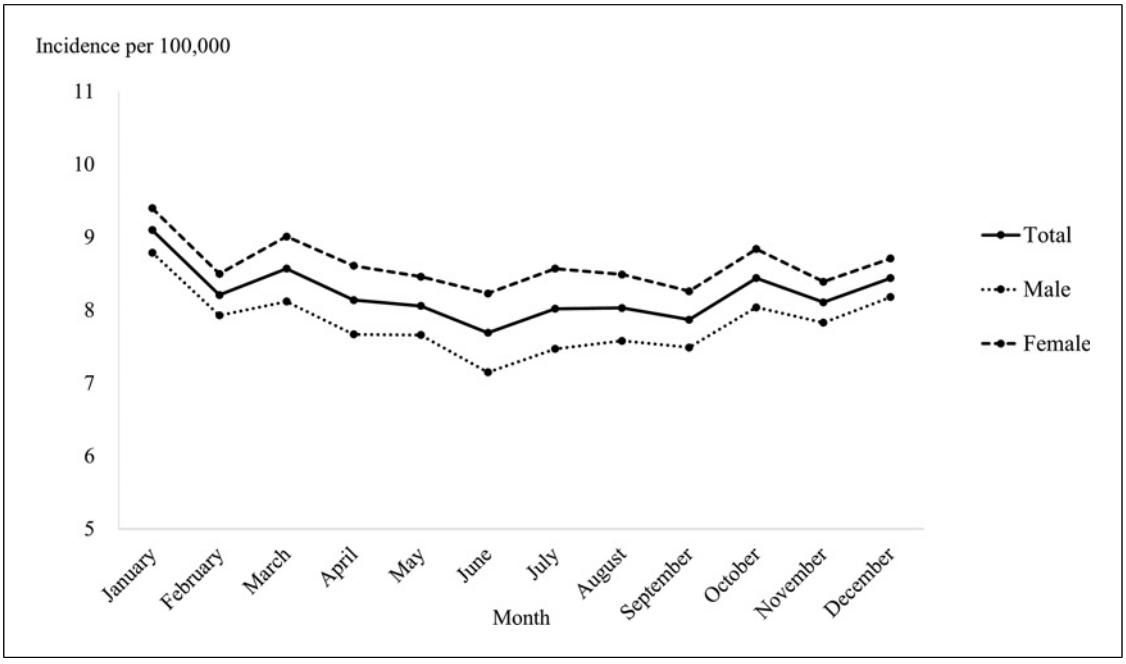

Fig. 1. The average monthly incidence of Bell's palsy in Korea in total and according to sex.

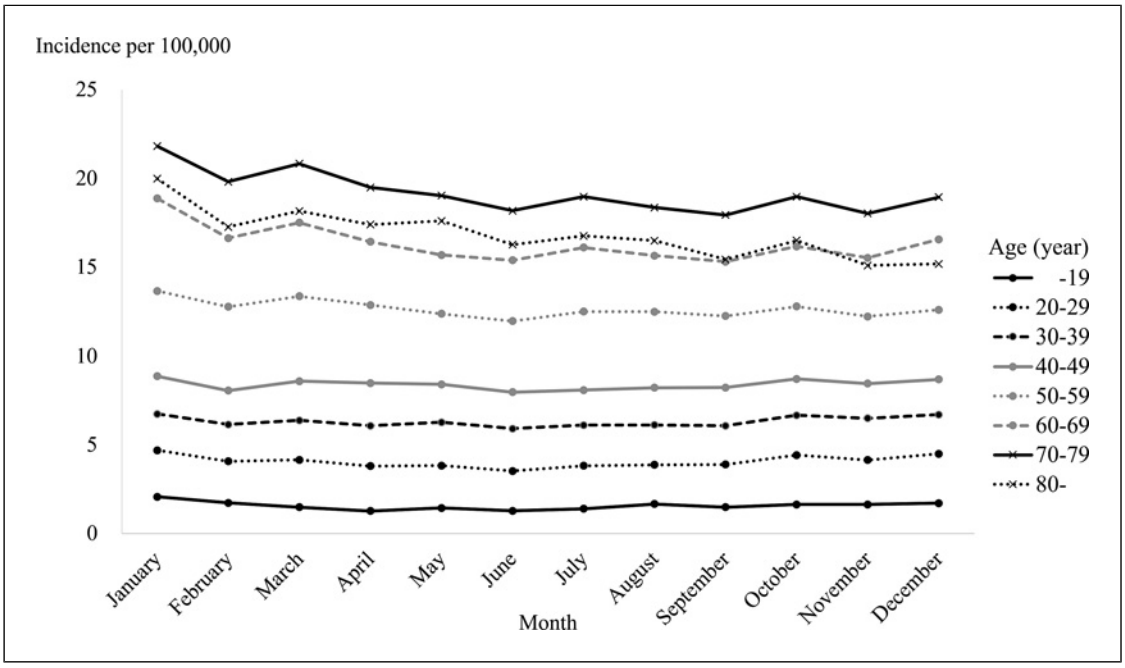

Fig. 2. The average monthly incidence of Bell's palsy in Korea according to age.

to be relatively high during cold seasons in a study with 863 patients in the USA [13]. There were significant seasonal and monthly variations in the distribution of Bell's palsy reported among 1,252 patients in Greece, with a decline observed during the summer and a peak during the autumn and winter, and the lowest and highest

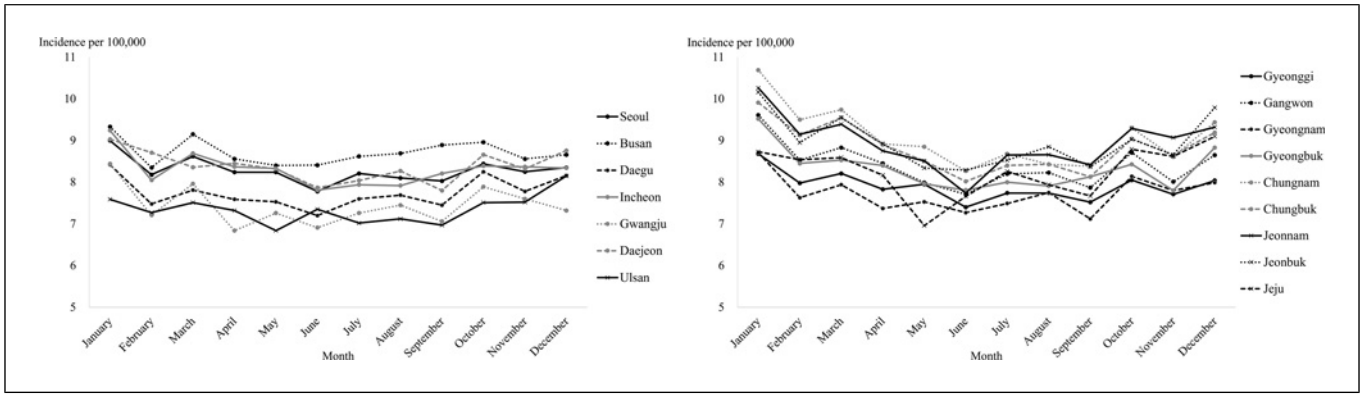

Fig. 3. The average monthly incidence of Bell's palsy in Korea according to residence.

incidence in July and January, respectively [3]. There was significant seasonal variation in the incidence of Bell's palsy among men, with an increasing incidence during the cold months in a study of 775 cases in Taiwan [10]. In a study with 591 patients in Germany, the numbers of patients with Bell's palsy were significantly different according to month, with the highest noted in December and the lowest in July [11]. In a study of 311 black patients with Bell's palsy in South Africa, winter was a significant predictor of Bell's palsy [14].

Several previous studies based on population data in Korea have also reported seasonal variation in Bell's palsy. In a study with Bell's palsy patients who received steroid medication based on the Korean National Health Insurance Claims Data, the seasonal incidence of Bell's palsy was highest in autumn at a significant level compared with spring and summer [12]. In another study based on the Korean Health Insurance Review and Assessment database, there was a significant difference in monthly incidence of Bell's palsy, with the highest reported in January during the winter and the lowest in June during the summer [7]. Although these previous studies were performed based on Korean population data as in the present study, patients with Bell's palsy who used traditional Korean medical service only were not included. Considering the previous reports and the present study, Bell's palsy may occur more frequently in cold months.

Environmental and meteorologic factors, which are different according to month or season, could be the cause of the monthly or seasonal variation in Bell's palsy. Low temperature, low humidity, and high atmospheric pressure were reported to be related to the seasonal and monthly incidence of Bell's palsy [12]. Cold weather may trigger the reactivation of HSV-1. Frequent and prolonged exposures to cold air may induce vasomotor changes in the face, the development of ischemia and edematous neuritis, and the reactivation of HSV-1 in the geniculate ganglion [13]. Acute respiratory infections are most common from late fall through early spring and can trigger reactivation of latent herpes infections [11, 13]. Cold and dry air in arid areas during the winter months may cause dehydration of the nasopharyngeal mucosa, resulting in increased susceptibility to upper respiratory infections. In addition, immunosuppression secondary to seasonal effects on mood may influence the seasonal variation of Bell's palsy [13]. Exposure to cold may increase the viscosity and coagulation of blood and induce atherosclerosis and thrombosis [10]. In turn, similar root causes could be related to the seasonal variation in Bell's palsy, considering vascular ischemia an etiology. Although the present study revealed significant monthly variations in Bell's palsy in all the age groups, the variation seemed more prominent in older patients than in younger patients. Monthly or seasonal variation in the pathogenesis of Bell's palsy could affect older patients more than younger patients. Immunosuppression and reactivation of latent herpes infections, upper respiratory infection, or ischemia may be the etiology of seasonal or monthly variation in Bell's palsy.

Reactivation of latent HSV-1 infection is thought to be a cause of vestibular neuritis [15, 16]. However, several studies have revealed no significant seasonal variations in vestibular neuritis [15–18]. Sudden sensorineural hearing loss also has an etiology of viral infection [16, 19–21]. It was reported that the incidence of sudden sensorineural hearing loss reached a significant peak in autumn based on population data in Taiwan [19], but most other studies reported no significant seasonal distributions [20–22]. However, many studies have reported seasonal variations of Bell's palsy compared to studies on seasonal variations of vestibular neuritis or sudden sensorineural hearing

loss. Bell's palsy might have greater likelihood of reactivation of latent HSV-1 infection that is prone to be influenced more by season than vestibular neuritis or sudden sensorineural hearing loss, resulting in a tendency to show monthly or seasonal variation.

There are several limitations to this study. First, patients with Bell's palsy were defined by diagnostic, medication, or treatment codes. Thus, all patients might not be reflected in the present study. However, the monthly incidence was verified during a long-term period of 13 years using whole population data. Second, the monthly variation was not investigated in patients who used medical service and those who used traditional Korean medical service, respectively, because we intended to comprehensively verify the monthly variation including patients in both medical and traditional Korean medical institutions.

Despite these limitations, monthly variation in Bell's palsy was verified based on whole population data from Korea. In addition, considering that many patients with Bell's palsy prefer traditional Korean medicine to conventional medicine, patients who used traditional Korean medicine for Bell's palsy should be considered in a population-based study. Studies about the monthly variation in Bell's palsy using population data in the world have yet to be sufficient. In addition, several previous studies using population data in Korea did not include patients in traditional Korean medicine. This study has significance because not only patients with Bell's palsy who used conventional medicine but also those who used traditional Korean medicine were included. Based on the significant monthly variation in Bell's palsy in this study, subsequent studies about the association of meteorologic and environmental factors with monthly variation may be valuable to verify the etiology of Bell's palsy.

Conclusion

There was significant monthly variation in the incidence of Bell's palsy with the highest observed in January and the lowest in June based on whole population data during a long-term period in Korea.

Statement of Ethics

This study was approved by the Institutional Review Board of the Uijeongbu St. Mary's Hospital (approval No.: UC21ZISI0104). All procedures complied with national and institutional guidelines for human experimentation and the Helsinki Declaration of 1975, as revised in 2013. This is a retrospective study, and the data collection of the patients does not involve patient privacy. Written informed consent was waived by the Institutional Review Board of the Uijeongbu St. Mary's Hospital.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Junhui Jeong: conceptualization, methodology, data collection, formal analysis, investigation, interpretation, validation, visualization, data curation, drafting, and final approval. Jae Ho Chung and Soorack Ryu: conceptualization, methodology, data collection, formal analysis, investigation, interpretation, validation, visualization, data curation, and final approval. Jong Dae Lee, Jin Kim, Ho Yun Lee, Chan Il Song, Young Sang Cho, and Se A Lee: data collection, formal analysis, investigation, interpretation, and final approval. Beomcho Jun: conceptualization, methodology, data collection, formal analysis, investigation, interpretation, validation, visualization, data curation, supervision, and final approval.

Data Availability Statement

The datasets used and/or analyzed during the current study are not publicly available due to privacy reasons but are available from the corresponding author on reasonable request. Further inquiries can be directed to the corresponding author.

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