Trend of Immunoglobulin Products Use and its Future Prediction: Analysis Using NDB Data

Akemi Kurisu (1)
Tomoyuki Akita (1), Junko Tanaka (1)
1 : Graduate School of Biomedical and Health Sciences, Hiroshima University

Objective : Demand for immunoglobulin preparations, plasma-derived medicines from human blood, has been rising, increasing the need for source plasma. Accordingly, the amount of blood to be secured through donation is also growing. This study constructs a forecasting model using Japan's National Database (NDB), applying an ensemble of machine learning and time-series analysis to predict future demand and plasma supply by disease trend.

Methods : With approval from the Ministry of Health, Labour and Welfare, NDB data from FY2012–2021 were analyzed. Causative diseases were identified with an ICD-10–based algorithm. Forecasting proceeded in two steps: (1) estimation of disease-, sex-, and age-specific consultation rates, and (2) estimation of per-patient prescription amounts to derive total demand. Six models were tested. External factors such as six new indications (2012–2021) and COVID-19 were incorporated. Based on backtesting and predictive performance, three models (XGBoost, SARIMA, Prophet) were selected and integrated into a weighted ensemble, assigning weights by disease characteristics. Results were compared with a prior MHLW study using linear regression.

Results : Backtesting confirmed that the ensemble improved stability by offsetting weaknesses of single models. Forecasts to FY2031 differed from linear regression: both suggested growth, but the ensemble captured recent structural shifts, indicating a slower and more realistic trajectory. Consequently, FY2031 projections diverged between models, implying that different outlooks for plasma demand could affect supply planning.

Conclusion : The weighted ensemble provided more reliable long-term forecasts than linear regression, incorporating demographic changes and expanded indications. It better reflected evolving demand dynamics, suggesting more practical growth rates. These findings may support stable plasma procurement and optimization of supply–demand balance.

Cognitive reserve and effects of air pollution mixture on cognitive function in dementia-free adults

Juyeon Ko (1)
Changsoo Kim (1), Jaelim Cho (1)

1 : Yonsei University College of Medicine/ Department of preventive medicine

Extensive evidence links air pollution exposure to cognitive decline, but the moderating effects of cognitive and brain reserve remain unclear. This study investigated whether cognitive and brain reserve moderate the association between air pollution and cognitive function in dementia-free adults. Cross-sectional data were obtained from 650 participants who underwent 3T brain MRI and the Montreal Cognitive Assessment (MoCA) scores. Cognitive reserve indicators were assessed through self-reported education, occupation, and social engagement. Brain reserve was quantified using the ventricle-to-brain ratio derived from MRI scans. Five-year average concentrations of particulate matter with diameters ≤10 and ≤2.5 μm and nitrogen dioxide were estimated based on residential addresses. Using partial least squares structural equation modeling, we created latent variables for the air pollution mixture and a composite cognitive reserve indicator and tested their moderating effects on MoCA scores and the risk of suspected mild cognitive impairment. A similar approach was used to assess the moderating effects of brain reserve. In individuals with average level of cognitive reserve, a 1-standard deviation increase in the air pollution mixture was associated with 0.24-points decrease in MoCA scores (95% confidence interval [CI], -0.311 to -0.163). This association was weakened in individuals with higher cognitive reserve (β = -0.116; 95% CI, -0.369 to -0.347) and intensified in those with lower cognitive reserve (β = -0.362; 95% CI, -0.107 to 0.043). The moderating effect of brain reserve was not significant. These findings suggest that higher cognitive reserve may offer protection against cognitive decline attributable to air pollution exposure.

Characteristics based on e-consent via mobile app in pregnant women with hyperglycemic disorders

Yoshiro Shirai (1)
Shoko Nukaya (1), Emiko Minakuchi (1), Akio Yoneyama (1), Takashi Omura (2), Yoshihiko Izumida (2)

1 : Health and Medical Research Group, Think Tank Division, KDDI Research, Inc.
2 : Department of Endocrinology and Diabetes, Saitama Medical Center, Saitama Medical University

Background : A comprehensive understanding of the patient characteristics associated with e-consent can inform the development of strategies to enhance clinical research participation. The present study investigated the characteristics associated with e-consent for clinical research via a mobile app among pregnant women with hyperglycemic disorders.

Methods : A total of 34 pregnant women with hyperglycemic disorders receiving care at Saitama Medical Center were enrolled in the study. The participants utilized the MLink-app, which facilitates access to clinical data, enables patient-reported outcome input (e.g., blood glucose, symptoms), and incorporates data sharing features and text messaging capabilities. Following the exclusion of one participant who opted out of research data sharing in the app settings, a research recruitment simulation was conducted using the app's text-messaging function. A descriptive comparison of app-derived data according to consent status was conducted to identify characteristic differences.

Results : Among 33 pregnant women (mean age 34.5 ± 4.7 years), the consent rate for participation in a new study via the app was 27.3% (n=9). Regarding app data-sharing settings, the consent group exhibited a higher frequency of agreement to data sharing with other medical institutions (88.9% [95% CI: 51.8–99.7] vs. 45.8% [25.6–67.2], p=0.047) and to secondary use by private companies (100% [66.4–100] vs. 75% [53.3–90.2], p=0.156).

Discussion : The present exploratory study shows that pregnant women who consented to participate in clinical research recruited via the app were more willing to share their medical information compared to those who did not consent. This finding suggests that efforts to promote data sharing, such as improving reliability and transparency, may lead to increased participation. Future studies should include large-scale research and evaluations of intervention effects.

Burden of diseases and injuries among children and adolescents in Taiwan

Wei-Cheng Lo (1,2)
Chih-Yu Liao (1), Hung-Yi Chiou (1,2,3)

1 : Master Program in Applied Epidemiology, College of Public Health, Taipei Medical University, Taipei, Taiwan
2 : School of Public Health, Taipei Medical University, Taipei, Taiwan
3 : Institute of Population Sciences, National Health Research Institutes, Miaoli, Taiwan

We aimed to estimate the burden of disease among children and adolescents aged 0–19 years in Taiwan and to identify age- and region-specific disparities in both fatal and non-fatal outcomes. A comprehensive analysis of national health databases was conducted under the Global Burden of Disease framework, incorporating high spatial resolution mapping. Data from 2011 to 2021 were included, and estimates of mortality and morbidity burden were derived from the linkage between the National Health Insurance Research Database, National Death Registry, and birth notification records. In 2021, the leading causes of disability-adjusted life years varied markedly by age group. Among children aged 0–4, neonatal disorders, preterm birth, and congenital anomalies were the predominant contributors. In the 5–14 age group, mental disorders, respiratory infections, asthma, musculoskeletal conditions, and falls were most prominent. For adolescents aged 15–19, road traffic injuries—particularly motorcycle-related—along with suicide and mental disorders, accounted for the greatest burden. Fatality rates from congenital malformations and leukemia declined among children aged 0–4, while increasing trends in deaths due to suicide and interpersonal violence were observed among those aged 10–19. Accidental fall-related mortality decreased among older adolescents. Spatial analyses identified asthma burden hotspots in northern, central, and eastern Taiwan among children aged 0–9. Mental health-related burdens were concentrated in urban areas and certain eastern regions among children aged 5–9 and adolescents aged 15–19. In contrast, injury-related burdens did not exhibit consistent spatial clustering but were more pronounced in remote and mountainous areas. Our findings provide critical evidence for the development of geographically targeted and age-specific public health strategies to reduce health disparities and improve the well-being of Taiwan's child and adolescent population.

Higher household income is associated with lower prevalence of depressive symptoms in Japan

Fumie Inui (1)
Keiko Tanaka (1), Yasumasa Ihara (2), Yoshihiro Miyake (1)

1 : Department of Epidemiology and Public Health, Ehime University Graduate School of Medicine
2 : Clinical Research Promotion Unit, Clinical Therapeutic Trial Center, Ehime University Hospital, Ehime, Japan

Abstract : There is limited evidence on the association between Socioeconomic status (SES) and depression in Japan. The present cross-sectional study investigated the association between SES and the prevalence of depressive symptoms in 8224 Japanese adults aged 20 to 95 years.

Methods : Household income was classified into five categories (< 3 million, 3 to < 4 million, 4 to < 6 million, 6 to < 9 million, and ≥ 9 million yen/year). Educational levels were classified into the three categories (Junior high school, high school, junior college or higher). Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) (the cutoff point at a score of 16 or above). Adjustments were made for age, sex, BMI, education level, employment, smoking status, alcohol consumption, Activities of Daily Living (ADL), leisure-time physical activity, current disease of stroke, diabetes mellitus, hypertension, and dyslipidemia, history of cancer and myocardial infarction, marital status.

Results : Of 8224 study subjects, the prevalence of depressive symptoms was 13.3% (n = 1092/8224). A higher household income was inversely associated with the prevalence of depressive symptoms. In the multivariable model, compared with the lowest household income, adjusted ORs (95% CI) of 3 to < 4 million, 4 to < 6 million, 6 to < 9 million, and ≥ 9 million were 0.81 (0.65－1.00), 0.69 (0.56－0.85), 0.77 (0.61－0.96), and 0.66 (0.51－0.84) respectively. A significant dose-response relationship was also observed (p for trend = 0.0017). On the other hand, no statistically significant association was observed between educational levels and the prevalence of depressive symptoms. Similar findings were also observed in the multiple imputed dataset.

Conclusions : This study suggests that a higher household income may be associated with a lower prevalence of depressive symptoms in Japan.