

ANALYZING PANDEMIC IMPACTS ON RESPIRATORY DISEASE PATTERNS AND FUNCTIONAL OUTCOMES IN GERIATRIC INPATIENTS

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ABSTRACT

Introduction: In 2020, COVID-19 has forced upon people for a change in their lifestyle to prevent and accommodate it, which may bring about its own set of positive and negative impacts.

Objectives: This research aims to analyze the effects of COVID-19 pandemic on the geriatric population in Jakarta through evaluation of changes in patient characteristics and disease variation of patients hospitalized in a major Indonesian hospital non-COVID geriatric inpatient ward.

Methods: This is a Retrospective study using secondary data of patients that was hospitalized in hospital's geriatric inpatient ward between May 2019-December 2020. Data was collected from EHR and analyzed using IBM SPSS Statistics 27.0 for a cross-sectional design study.

Results: Changes of patients' age group and gender is not statistically significant. The notable shifts within medical diagnosis group are the increase of incidence of non-COVID respiratory infections (9.6% to 12.64%), encephalopathy cases (2.7% to 6.7%), and gastrointestinal bleeding (5.7% to 7.1%), and decrease in cardiovascular diseases incidence (20.5% to 13.8%) and neoplasm cases (12.8% to 8.6%). Within functional diagnosis group, there is increase in mobility disorders (24% to 30.1%).

Conclusion: COVID-19 pandemic does not cause significant change in patients' characteristics (gender and age group), but significantly causes a shift in the variation of diseases recorded as the main reason for patients' admission into the inpatient ward. Future studies should evaluate strategies to help geriatric patients in cases like COVID pandemic, due to the increased incidence in mobility disorders, non-COVID respiratory infections, gastrointestinal bleeding, and encephalopathy.

Key words: COVID-19, functional diagnosis, geriatric patients, pandemic

ABSTRAK

Pendahuluan: Pada tahun 2020, COVID-19 menyebabkan perubahan gaya hidup Masyarakat sebagai upaya pencegahan dan penyesuaian. Pada akhirnya, hal tersebut dapat membawa dampak positif maupun negatif.

Tujuan: Penelitian ini bertujuan untuk menganalisis efek pandemi COVID-19 pada populasi geriatri di Jakarta melalui evaluasi perubahan karakteristik pasien dan variasi penyakit pada pasien yang dirawat di bangsal rawat inap geriatri non-COVID sebuah rumah sakit rujukan Indonesia.

Metode: Penelitian ini merupakan studi retrospektif menggunakan data sekunder dari pasien yang dirawat di bangsal rawat inap geriatri antara Mei 2019 hingga Desember 2020. Data dikumpulkan dari rekam medis elektronik (EHR) dan dianalisis menggunakan IBM SPSS Statistics 27.0 untuk desain penelitian potong lintang.

Hasil: Perubahan kelompok usia dan jenis kelamin pasien tidak menunjukkan signifikansi statistik. Pergeseran yang menonjol pada kelompok diagnosis medis meliputi peningkatan insidensi infeksi saluran pernapasan non-COVID (9,6% menjadi 12,64%), kasus ensefalopati (2,7% menjadi 6,7%), serta perdarahan saluran cerna (5,7% menjadi 7,1%), serta penurunan insidensi penyakit kardiovaskular (20,5% menjadi 13,8%) dan kasus neoplasma (12,8% menjadi 8,6%). Pada kelompok diagnosis fungsional, terdapat

peningkatan gangguan mobilitas (24% menjadi 30,1%).

Kesimpulan: Pandemi COVID-19 tidak menyebabkan perubahan signifikan pada karakteristik pasien (jenis kelamin dan kelompok usia), tetapi secara signifikan menyebabkan pergeseran variasi penyakit yang tercatat sebagai alasan utama pasien dirawat di bangsal rawat inap. Penelitian selanjutnya perlu mengevaluasi strategi untuk membantu pasien geriatri dalam situasi seperti pandemi COVID, mengingat peningkatan insidensi gangguan mobilitas, infeksi pernapasan non-COVID, perdarahan saluran cerna, dan ensefalopati.

Kata Kunci: COVID-19, Diagnosis Fungsional, Pasien Geriatri, Pandemi

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INTRODUCTION

The year 2020 is a very eventful year with the emergence of the novel coronavirus named SARSCov2 and its extremely contagious nature causing the Corona Virus Disease (COVID-19) pandemic. President Joko Widodo formally announced the first case of COVID-19 identified in Indonesia on 2nd March 2020.

In 2020, COVID-19 has caused a spike in the number of patients needing to be treated in the hospital. A lifestyle change is also needed to prevent and accommodate COVID-19, which may bring about its own set of positive and negative impacts. The elderly population is known to be one of most susceptible to COVID-19 and is also known to be the population to have the most difficulty in adapting to a sudden change in their lifestyles.

Effects COVID-19 may have on a person includes being afflicted by the disease itself and its complications, or the effects of lifestyle changes COVID-19 has forced upon people, for example but not limited to quarantine and economic challenges. It is with this idea in mind that the researcher began wondering whether the presence of COVID-19 has had any effect to the characteristics of elderly population that needs geriatric inpatient rehabilitation, including the age, gender, and disease variation that places them into the inpatient ward, compared to before the presence of COVID-19.

METHODS

Study Design This is a cross-sectional study that uses total sampling of all geriatric patients that have been hospitalized in geriatric rehabilitation division in the years 2019-2020. Ethical permission has been granted by Research Module Team (KET- 012/UN2.F1.D1.2/PDP.01/AW/2021).

Participants There is a total of 635 data available between the 10 months before and 10 months after COVID-19 is declared to have entered Indonesia in March 2020. Data collection was done in July 2021. Data is grouped based on the patient's time of admission:

- Pre-declaration: May 2019 – February 2020, 10 months before President Joko Widodo declared COVID-19 has entered Indonesia
- Post-declaration: March 2020 – December 2020, 10 months after President Joko Widodo declared COVID-19 has entered Indonesia

As geriatric hospitalization frequently involves multiple medical complications, only the first (main) medical diagnosis recorded in the EHR is taken into consideration. The same with functional diagnosis.

Outcome Measurements Comparison is done between the number of cases pre- and post-declaration in 4 categories: gender, age group, medical diagnosis group, and functional diagnosis group. Since all 4 comparison is a categoric-categoric comparison, chi-square is used for all comparison

Statistical Methods Data is analyzed using IBM SPSS Statistics 27.0.

RESULTS

There is a total of 635 data available between the 10 months before and 10 months after COVID-19 is declared to have entered Indonesia in March 2020. Data is sorted and cleaned using Microsoft Excel and is then statistically analysed using IBM SPSS Statistics 27.0.

Comparison is done between the number of cases pre- and post-declaration in 4 categories: gender, age group, medical diagnosis group, and functional diagnosis group. Since all 4 comparison is a categoric-categoric comparison, chi-square is used for all comparison. Result is shown in Table 1.

Due to space limitation, only the 10 most frequent medical diagnosis group is included in the table.

Gender

Patients are grouped into either female or male. Chi-square analysis results in p-value of 0.339. This indicates that there is no evidence of significant differences in the gender proportion of the patients in the inpatient geriatric ward before and after the COVID-19 pandemic is declared to have entered Indonesia.

Age Group

Patients are grouped into 3 age categories: transition (60-74 years old), average old (75-85 years old), and longevity (above 86 years old). Chi-square analysis results in p-value of 0.197. This indicates that there is no evidence of significant differences in the age group proportion of the patients in the inpatient geriatric ward before and after the COVID-19 is declared to have entered Indonesia.

Medical Diagnosis Group

The primary medical diagnosis for patients' staying in the inpatient ward is assigned a code using ICD 10 coding, which uses a mix of alphabets to code the family of disorders and then numbers to code specific diseases and conditions. The data is then analyzed based on the family/groups of disorders they fall into.

Significant differences were observed in the distribution of main medical diagnosis before and after the pandemic ($p=0.001$). *Cramer's V* analysis indicated a small effect size ($V=0.242$), suggesting a measurable but modest shift in disease patterns. Notably, there

was an increase in cases related to respiratory infections, encephalopathy, gastrointestinal bleeding, and mobility-related disorders, while cardiovascular and neoplastic conditions declined (Table 1). These shifts likely reflect changes in healthcare-seeking behavior, hospital admission priorities, and indirect effects of pandemic-related restrictions. The multinomial logistic regression (Table 2.) showed that the distribution of medical diagnosis group significantly shifted between the pre- and post-COVID19 periods ($\chi^2 = 37.126$, $p<0.001$). Post COVID-19, there were significant increases in the proportion of neoplasms ($\text{Exp(B)}=2.73$, $p=0.049$), mental and behavioral disorders ($\text{Exp(B)}=2.70$, $p=0.040$) compared to the pre-COVID-19 period. Other disease categories such as respiratory, digestive, endocrine/metabolic, and injury-related conditions showed non-significant increases, while nervous system and skin diseases did not change markedly. The model explained approximately 6.3% of the variance in disease distribution (Nagelkerke $R^2 = 0.063$), suggesting that while COVID-19 significantly affected disease pattern shifts, other factor may also contribute.

Functional Diagnosis Group

Functional diagnosis distribution, classified according to ICF categories, also demonstrated significant changes across the two timeframes ($p=0.002$), with a small effect size (*Cramer's V*= 0.246). Mobility and self-care limitations became more prominent post-pandemic declaration, while cases categorized under general activity or communication functions slightly decreased.

Table 1. Distribution of Geriatric Inpatient Characteristics Before and After the COVID-19 Declaration in Indonesia, and Results of the Chi-Square Test

Characteristic s	Pre- Declaration (May 2019 –Feb 2020) n=366	Post- Declaration (March- Dec 2020) n=269	χ^2	p- Valu e			
Age, Median (IQR)	68 (64-73)	69 (64-75)	--	--	Mental and Behavior al Disorder s (F)	12 (3.3)	3 (1.1)
Total patient	366 (100)	269(100)			Diseases of Nervous System (G)	10 (2.7)	18 (6.7)
Gender			0.914	0.339			
Women	171 (46.7)	136 (50.6)					
Men	195 (53.3)	133 (49.4)					
Age Group			3.247	0.197			
Transitio n (60-74)	289 (79.0)	136 (50.6)					
					Diseases of Skin and Subcutan eous Tissue (L)	10 (2.7)	8 (3.0)
Average old (75- 85)	71 (19.4)	68 (25.3)					
Longevit y (86+)	6 (1.6)	5 (1.9)					
Medical Diagnosis Group			37.12 6	0.001 *	Injuries, Poisonin g, and Other Consequ ences of External Causes (S)	10 (2.7)	9 (3.3)
Diseases of Circulato ry System (I)	75 (20.5)	37 (13.8)					
Diseases of Respirato ry System (J)	50 (13.7)	45 (16.7)			Functional Diagnosis Group		20.38 4
Neoplas m (C)	47 (12.8)	23 (8.6)			Mobility	88 (24.0)	81 (30.1)
Diseases of Digestive System (K)	45 (12.3)	27 (10.0)			Mental Function s	46 (12.6)	33 (12.3)
Diseases of Blood and Immunit y (D)	31 (8.5)	27 (10.0)			Sensory Function and Pain	9 (2.5)	11 (4.1)
Endocrin e, Nutrition al and Metaboli c Diseases (E)	26 (7.1)	16 (5.9)			Function of Respirato ry System	8 (2.2)	31 (11.5)
Abnorma l Sympto ms, Signs, Clinical and Laborato ry Findings (R)	22 (6.0)	13 (4.8)			Function of Digestive System	6 (1.6)	6 (2.2)
					Function of Metaboli c System	5 (1.4)	6 (2.2)
					Other Disorder s	1 (0.3)	7 (2.6)
					Not Determin ed	202 (55.5)	94 (34.9)

*p<0.05 indicates statistical significance.

χ^2 = Chi-square test statistic. ICD-10: International Classification of Diseases, 10th

revision. ICF: International Classification of Functioning, Disability, and Health.

Table 2. Multinomial Logistic Regression Analysis of Medical Diagnosis Group Before and After the COVID-19 Period

Medical Diagnosis Group	B	p-value	Exp(B)	95% CI for Exp (B)
Diseases of Circulatory System (I)	0.994	0.040*	2.703	1.046-6.987
Diseases of Respiratory System (J)	0.393	0.486	1.481	0.571-3.844
Neoplasm (C)	1.002	0.049*	2.725	1.004-7.309
Diseases of Digestive System (K)	0.799	0.113	2.222	0.828-5.964
Diseases of Blood and Immunity (D)	0.426	0.407	1.531	0.559-4.189
Endocrine, Nutritional and Metabolic Diseases (E)	0.773	0.155	2.167	0.747-6.287
Abnormal Symptoms, Signs, Clinical and Laboratory Findings (R)	0.814	0.148	2.256	0.749-6.800
Mental and Behavioral Disorders (F)	1.674	0.032*	5.333	1.152-24.684
Diseases of Nervous System (G)	-0.300	0.612	0.741	0.232-2.362
Diseases of Skin and Subcutaneous Tissue (L)	0.511	0.430	1.667	0.468-5.931
Injuries, Poisoning, and Other Consequences of External Causes (S)	0.393	0.537	1.481	0.425-5.161

DISCUSSION

The Effect of COVID-19 Pandemic on Total Inpatient Admission

In the 10 months before COVID-19 was officially announced in Indonesia (March 2020), geriatric inpatient ward took care of a total of 366 geriatric patients, while in the 10 months after, it treated 269 geriatric patients. With the COVID-19 virus especially dangerous for the elderly, this population was advised to stay home and minimize exposure. Hospitals, meanwhile, prioritized urgent COVID-19 cases, reallocating manpower and resources to critical care, which reduced the capacity for non-COVID services.¹

The decrease in general non-COVID geriatric inpatient ward may be caused by two main factors. Either patients' reluctance to visit hospitals in fear of contracting COVID-19 or limited services availability during

pandemic restrictions. Moreover, some older patients might have been infected by the COVID-19 virus and thus hospitalized in the COVID-19 ward, whose data is not included in this research, indirectly causing the decrease in patient volume seen in the non-COVID geriatric inpatient ward.

The Effect of COVID-19 Pandemic on Gender and Age Proportion

According to Jakarta's 2019 population data, there are a total of 869.684 geriatric (above 60 years old) residents living in Jakarta. Geriatric residents consist of roughly 53.14% women and 47.86% men². The near-equal male-female proportion found both pre- and post- pandemic aligns with this distribution, suggesting no significant pandemic-related gender shift in hospitalizations. Similarly, most inpatients in both periods belonged to the "transition" age group (60-74 years), reflecting population demographics. These findings imply that the pandemic did not alter the age or sex composition of geriatric inpatients, consistent with national trends.

The Effect of COVID-19 Pandemic to Medical Diagnosis Group Proportion

Increase in Non-COVID Respiratory Infections

The increase in non-COVID respiratory infections observed in this study highlights the intersection of immunosenescence, decreased physical activity, and nutritional vulnerability during pandemic restrictions. Aging diminishes both innate and adaptive immune responses, including mucociliary clearance and antibody production, thereby predisposing older adults to respiratory tract infections³. Pandemic-induced physical inactivity and social isolation further impair immune function and cardiorespiratory fitness⁴, while reduced food access and lower quality diets contribute to malnutrition that compromises immune defense⁵.

This increase represents a rehabilitation challenge. Respiratory

infections in older adults frequently trigger functional decline due to prolonged bed rest, fatigue, and muscle wasting⁶. Evidence from pulmonary rehabilitation studies shows that integrating breathing retraining, graded aerobic conditioning, and airway clearance techniques significantly improves lung function and exercise capacity⁷. Therefore, early mobilisation and respiratory-focused rehabilitation should be prioritized in geriatric wards to restore pulmonary function and prevent disability.

In this study, the upward trend in respiratory diagnoses likely reflects a combination of increased infection susceptibility and pandemic-related deconditioning. Rehabilitation services must anticipate higher demand for integrated pulmonary-functional programs addressing both respiratory recovery and physical reconditioning. Additionally, preventive measures such as vaccination, nutritional support, and physical activity promotion are essential for preserving respiratory resilience in this population⁸.

Increase in Encephalopathy and Gastrointestinal Bleeding Cases

The rise in encephalopathy cases (2.7% to 6.7%) may relate to postponed management of chronic diseases such as renal or hepatic disorders. Lockdowns delayed essential care, leading to metabolic decompensation and subsequent cerebral dysfunction⁹⁻¹¹. Similarly, the increase in gastrointestinal bleeding (from 5.7% to 7.1%) may result from heightened self-medication with NSAIDs or traditional herbal drinks (“jamu”) believed to boost immunity, which can interact with anticoagulants and increase bleeding risk^{12,13}.

Decrease in Diseases of Circulatory and Neoplasm System

Conversely, cardiovascular and neoplastic cases markedly declined. Similar reductions in stroke and cancer diagnoses have been reported internationally, attributed to delayed health-seeking behavior and

service disruptions¹⁴⁻¹⁷. Patients experiencing mild cardiovascular (lethargy, headache, numbness, and speaking difficulties) or oncologic symptoms may have avoided hospitals due to infection fears, leading to underdiagnosis and potential late-stage presentations later on. Kaufman H. et al. saw a significant decline in newly identified cancer patients across the United States, and Lai A. et al. that describes the drop of urgent cancer referrals and chemotherapy attendance in the pandemic, also in the United States. The United Kingdom saw a 75% decrease of suspected cancer referrals, and the Netherlands Cancer Registry reported up to 40% decline of weekly cancer incidence.^{16,17}

Unsurprisingly, the decrease of hospital visits is a given due to many services are postponed/reduced, and people were encouraged to stay at home to prevent the spread of COVID-19 infection. However, a similar phenomenon where a decrease of incidence of stroke and other CVDs seen in hospitals and emergency rooms after COVID-19 pandemic have been observed in other countries such as America, Barcelona, Italy, England, and China.^{14,15,18-20}

In normal situation before pandemic, such symptoms often perceived as mild ailments that will disappear with or without OTC medications. Patients have tendencies to only have them checked by a healthcare professional after encouraged by people around them. In this pandemic, patients fearing of the COVID-19 infection risk may be even more discipline to go to a hospital and have their “mild” symptoms checked. Social distancing caused by the pandemic may have greatly reduced detection of CVD signs and symptoms and subsequent hospital admission.^{14,18-20}

Banerjee A. et al claimed that COVID-19 pandemic has direct (infected) and indirect effects (healthcare system strain and related behavioral changes) on individuals with CVD. The indirect effects include reduction in CVD referral, diagnosis, and treatment rates. Using the National Mortality Data for England and Wales, they estimated between 49,932 to 99,865 additional deaths in the group of

people with CVD caused by indirect COVID-19 effects.¹⁵ It is suspected that the same phenomenon explained in the previous paragraphs are also occurring in Jakarta too, causing the decrease in CVD cases seen in our geriatric inpatient ward.

The Effect of COVID-19 Pandemic to Functional Diagnosis Group Proportion

“Geriatric Giant Symptoms” is a phrase first coined by Professor Bernard Isaacs in 1995. The term refers to the final common symptom pathways for numerous conditions of geriatric patients, which are immobility, instability, incontinence, and impaired intellect or memory. These symptoms, when not addressed properly, often lead to poor outcomes and increased mortality.²¹

Major transfer of resources to manage the coronavirus causes interventions for these “Giant Symptoms” to be less accessible to the older patients. Numerous elective procedures are postponed in the emergence of the COVID-19 virus to make space for the infected and avoid unnecessary risk of exposure. Procedures that have been postponed also include those that are beneficial for the elderly, such as joint replacement surgery that is important for the patient’s pain control and mobility. Delaying necessary procedures tends to worsen the pre-operative state, which is linked to poorer prognosis.²¹

Deferring all but urgent procedures result in major delays in geriatric cataract, orthopaedic, and urological interventions that will lead to reduced mobility and increased pain levels, instability, incontinence, cognitive symptoms, and independence levels. This may be further exacerbated by economic issues brought by the pandemic, which affects both the income of the patients and resources for the health services they need.²¹

Reasons stated above is suspected to be the reason for the increase in patients suffering from immobility as their primary functional diagnosis, going from 24.0% (88

cases) in pre-declaration to 30.1% (81 cases) in post-declaration. The notable rise in mobility-related diagnoses mirrors global findings on pandemic-related deconditioning. Hospital confinement, reduced outpatient rehabilitation, and limited physical activity all accelerate functional loss. Immobilization in older adults can reduce lower-limb strength and walking capacity, increasing risk of falls and dependence²². Sarcopenia – a progressive decline in skeletal muscle mass and function – is a major contributor to this decline and has been strongly associated with frailty and hospitalization readmission²³.

Increase in cases of functional diagnosis group of Function of Respiratory from 8 (2.2%) cases pre-declaration to 31 (11.5%) cases during post-declaration is linked to the increase in both COVID and non-COVID respiratory infection primary medical diagnosis. Cases labeled as “Not Determined” means that there was no functional diagnosis recorded for that patient. There are 202 (55.5%) cases pre-declaration and 94 (34.9%) cases post-declaration labeled as Not Determined.

The principle of Physical Medicine and Rehabilitation (PM&R) is to focus on increasing a person’s functional abilities in accordance to their potential of retaining and/or returning their quality of life by preventing or decreasing disability as much as possible. As such, one of the main responsibilities of a PM&R physician is to record the functional diagnosis of patients, especially in geriatric inpatient wards where they are the main overseer of the ward. The decrease of cases without proper record of their functional diagnosis from pre- to post-declaration may be a sign that the responsible PM&R physicians in charge are becoming more disciplined in recording functional diagnosis too, instead of just the medical diagnosis.²⁴

STUDY LIMITATION

This study only takes data from a single ward, specifically the hospital’s geriatric inpatient ward. It is therefore limited

in insight to only information that may be procured from a single ward. There may be more geriatric patients taken care of by other wards, such as the COVID-19 ward, whose data was not included in this research. This limitation prevents us from procuring more information of the effects of the pandemic towards the geriatric population. Examples of information that may be obtained by taking data from other wards includes but not limited to:

1. Proportion of geriatric patients infected by COVID-19
2. Proportion of geriatric patients immediately discharged to home after COVID-19
3. Proportion of geriatric patients referred for rehabilitation after COVID-19
4. Proportion of geriatric patients' deaths caused by COVID-19

CONCLUSION

There is change in proportion of disease variation of patients receiving inpatient geriatric rehabilitation in Rumah Sakit Cipto Mangunkusumo due to the COVID-19 pandemic, but none in proportion of age and gender. Both medical diagnosis and functional diagnosis show significant changes. From the medical diagnosis, the notable changes are increased incidence of non-COVID respiratory infection, encephalopathy, and gastrointestinal bleeding, and a sharp decrease in cardiovascular disease and neoplasm incidence. From functional diagnosis, there was an increase in mobility disorders and respiratory function disorders.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

DATA AVAILABILITY

The data are available from the corresponding author on reasonable request.

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