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An Overview of the Quality of Life of Post Severe Brain Injury Patients within 2018-2020 Period of Time in Dr. Soetomo General Academic Hospital based on Short Form-36.

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ABSTRACT

Introduction: Approximately 90 million traumatic brain injury (TBI) cases worldwide exist yearly. TBI pathophysiology varies, which may cause diverse complications. These complications may decrease the patients' quality of life. **Objective:** Describing the quality of life of traumatic brain-injured patients after being treated at Dr. Soetomo General Academic Hospital Period 2018-2020. **Methods**: This research is a descriptive cross-sectional study using SF-36 questionnaire data from patients with post-severe brain injury at Dr. Soetomo General Academic Hospital in 2018-2020. **Results:** The value of the physical component (59.9) and mental component (68.6) in patients with severe brain injury at Dr. Soetomo General Academic Hospital showed a good quality of life, with values in the SF-36 domains, namely physical function (58.2), physical limitations (46.7), body pain (73.6), general health (61.3), vitality (65.3), social functioning (72.5), emotional limitations (60), and mental health (76.5) is above the threshold value (50) except for physical limitations (46.7).**Conclusion:** Patients with severe brain injury had a good quality of life after receiving treatment in Dr. Soetomo General Academic Hospital.

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INTRODUCTION

A brain injury is a non-degenerative and non-congenital disturbance in normal brain function caused by a blow, impact, or trauma to the head that allows a force to pass through the skull and enter brain tissue.[1] Traffic accidents, fall injuries, and gunshot wounds are all causes of brain injury. Traffic accidents are one of the most common causes of brain injury.[2] Annually, 90 million people worldwide suffer from traumatic brain injury (TBI).[2] Complications that arise after TBI include psychiatric disorders, spasticity, seizures, and motor disorders.[3,4] The recovery period for TBI patients should start before two years. An adequate rehabilitation program is needed to stimulate the neuroplasticity and keep the patient from getting complications that can hurt cognitive function and hinder daily activities.[5]

Quality of life measurement in TBI patients is highly recommended because it can be used as information to estimate complications suffered by patients, measure the effectiveness of treatment given to patients, and obtain information about their general health status.[6] One of the most comprehensive scales for measuring the quality of life for TBI patients is the Short Form-36 (SF-36).[7] This study aims to describe the quality of life of patients with severe brain injury after being treated at Dr. Soetomo General Academic Hospital Period 2018-2020 as well as evaluate and observe the limitations in the quality of life of severe brain injury patients after being hospitalized.

OBJECTIVE

To describe the quality of life of severe brain-injured patients after being treated at Dr. Soetomo General Academic Hospital from 2018-2020.

METHODS

This study is a descriptive cross-sectional study using SF-36 questionnaire data from severe brain injury patients at Dr Soetomo General Academic Hospital from2018-2020. The population is patients with severe brain injury at Dr. Soetomo General Academic Hospital. The subjects were hospitalized patients diagnosed with severe brain injury, and the samples were taken by total sampling, namely the technique of taking all available samples. The researcher looked for the patients hospitalized with the diagnosis of severe brain injury in the 2018-2020 period in the central database system and matched them with the outpatients that visited the polyclinic for post-severe brain injury control.

Researchers explained the purpose and meaning of each question and helped patients fill in the scale for each question. While the patients filled out the scale, the researchers were on the phone guiding the respondents through each question. The subject's location outside Surabaya is one of the obstacles in this study. Another obstacle found was the pandemic that prevented researchers from meeting directly with patients, so the process of contacting patients was carried out by telephone. Of the study population, 43 were unreachable, and 2 had died. The 15 people who were chosen were 5 women (33.3%) and 10 men (66.7%).

The inclusion criteria were post-severe TBI patients who visited Dr. Soetomo General Academic Hospital and outpatient clinics in a good state of consciousness (GCS 15) during the 2018-2020 period. Meanwhile, the exclusion criteria were inpatients diagnosed other than severe brain injury at Dr. Soetomo General Academic Hospital and were not in a state of compos mentis for the 2018-2020 period. In finding subjects, the researchers looked for the medical record numbers of patients diagnosed with severe brain injury at the Neurosurgery Polyclinic from 2018-2020 and contacted the subject to be given the SF- 36 questionnaire. The measurement uses a Short Form-36 questionnaire converted into Google Forms to make it easier for respondents to fill out. Following that, the mean of the eight dimensions was converted into physical and mental components, and the results were compared to the Indonesian population's standard values. Searching for subjects based on predetermined inclusion and exclusion criteria began on March 1, 2021.

RESULTS

Characteristics of respondents

Most of the respondents in this study were men (66.7%) and adults (86.7%) with an age range of 18-64 years (Table 1). The severity of the injury is severe brain injury (GCS <9).

Short Form-36

The SF-36 is a health status used to measure a patient's health status. It has 8 domains, which are physical function, physical limitations, body pain, general health, vitality, social function, emotional limitations, and mental health.[8] This questionnaire consists of a total of 36 questions that are spread across each domain. In this study, researchers used an already validated Indonesian-translated version of the questionnaire, so there is no need for validation.

The physical domain has the most questions, which are ten questions. As with vitality, there are four questions to answer about physical limitations.

Then, there are six questions about general health. The two questions in the social function category are the same as the two questions in the body pain category. Then there are the five questions about mental health and the three about emotional limitations.

These domains are divided into two summaries of their respective components, the physical component, and the mental component. The summary of the physical component consists of physical function, physical role, pain, and general health, while the summary of the mental component consists of the role of emotion, vitality, mental health, and social function.[9]

Physical Function

Questions included in this domain are questions 3-12, which consist of 3 choices of questions that have a value of 0, 50, and 100. From this questionnaire sample, three samples have an average value of 100, namely MAD004, PAJ005, and POE012. The lowest value in this domain is 0, which is obtained from MFR007 and MMW009. The final mean of the physical function domain in the sample population was 58.2 (Figure 1).

Physical limitations

Questions included in this domain are questions 13-16, which consist of two answer choices, "yes" and "no." The answer "yes" has a value of 0 while "no" has a value of 100. Six respondents in this domain have the highest score, 75. Meanwhile, the lowest value is 0, which MRK014 obtains. The final mean of the physical limitations domain in the sample population is 46.7 (Figure 2).

Body pain

Questions included in this domain are questions 21 and 22. Question 21 has six answer choices with multiples of 20 ranging from 0 - 100. Meanwhile, question number 22 has five answer choices with a value of multiples of 25, which ranges from 0-100. In this domain, 6 of 15 respondents got an average score of 100. As for the lowest average, 2 of 15 respondents have an average of 45 for this domain. The final average of the body pain domain is 73.67 (Figure 3).

General health

Questions included in this domain are questions 1, 2, 33, 34, 35, and 36. Questions numbered 1, 2, 34, and 36 have five answer choices in multiples of 25, with a minimum of 0 and a maximum value of 100. Questions 33 and 35 have five answer choices with multiples of 20, ranging from 0-100. In this domain, there were no respondents with an average value of 100, but the highest average value was 95, obtained by 2 of 15 respondents, while the lowest average value, 20, was obtained by one respondent. The final mean of general health was 61.3 (Figure 4).

Vitality

Questions included in this domain are questions 23, 27, 29, and 31. Questions numbered 23, 27, 29, and 31 have six answer choices in multiples of 20, with a minimum value of 0 and a maximum of 100. In this questionnaire, two respondents (13.3%) got the highest score of 100. Meanwhile, the lowest score was 30, obtained by two respondents (13.3%). The final mean in the vitality domain was 65.3 (Figure 5).

Social function

The social function is one of the domains with the least number of questions, containing only two questions, numbered 20 and 32. The two questions have five answer choices in multiples of 25 with a minimum value of 0 and a maximum of 100. In this domain, one respondent (6.7%) gets the lowest score of 0, while the highest value is obtained by four respondents (26.6 %). The final average of these respondents was 72.5 (Figure 6).

Emotional limitations

Questions included in this domain are questions17-19, which consist of two answer choices, "yes" and "no." In this domain, two respondents (13.3%) got the lowest value of 0, while the highest score was 100, which was obtained by five respondents (33.3%). The final mean in the emotional limitation domain was 60 (Figure 7).

Mental health

Questions included in this domain are 24,25,26,28, and 30, which consist of six answer choices in multiples of 20, with a minimum value of 0 and a maximum value of 100. In this domain, one respondent (6%) got the highest value of 100, while another (6%) got the minimum value of 44. The final mean in the mental health domain was 76.5 (Figure 8).

Physical and mental components

Physical components were obtained by averaging 4 domain scores: physical function, physical limitations, body pain, and general health. Meanwhile, the mental component was obtained by averaging four other domain scores: vitality, social function, emotional limitations, and mental health. The values of the physical and mental components, respectively, are 59.9 and 68.6 (Table 2).

DISCUSSION

In this study, the age of the respondents was divided into two categories: adults (18-64 years old) and the elderly (>65 years old). According to the data,

most respondents are adults (86.7%) because traumatic brain injury cases are more common in men aged 18-35 due to traffic accidents.[10] In addition, age is an essential factor in determining the prognosis of brain injury patients. The prognosis will get worse with increasing age.[11] This causes the number of elderly respondents in this study small. The quality of life assessment with the SF-36 was carried out in 2 stages, first, the conversion of values to 0-100, then the average conversion for each domain. The SF-36 instrument produces a normative value which has an average value of ±SD. A score above 50 for each domain indicates a good quality of life, while a score below 50 indicates poor quality of life.[12]

Table 3. shows that the cumulative score of respondents has an average quality of life score above the normative average, which is 50, except for the physical limitations component, which has a score of 46.7. The research results were obtained well and aligned with Hu *et al.*, concluding that brain injury patients have a good quality of life and an increase in SF-36 score after discharge from the hospital.[13]

Table 4. shows that male patients have a worse quality of life than female patients. On the other hand, data showed that adult patients had a better quality of life than elderly patients. Neuroplasticity is the brain's ability to repair and adapt as a compensatory mechanism for trauma.[14] The area that is an important site for neuroplasticity is the gyrus dentatus which serves for memory storage.[15] Many factors that affect neuroplasticity include age, hormones, sleep patterns, and daily activities.[16]

Neuroplasticity in older people is lower than in younger people.[17] This is because, after the brain has fully developed, a physiological neurodegeneration process occurs alongside the aging process in humans. In addition to age, hormones also play a role in neuroplasticity. Estrogen is a hormone that contributes to neuroplasticity. According to research, estrogen plays a role in cell proliferation and neurogenesis in the hippocampus of experimental animals.[18] Estrogen also helps to increase synapses in the hippocampus and causes morphological changes, which improve hippocampal functions related to memory and learning. However, estrogen affects neuroplasticity in women but not always in men.[18] As a result, it is found that the quality of life of female respondents is higher than that of male respondents.

Aside from hormones and age, quality sleep has an impact on neuroplasticity. Sleep is classified into two types based on electroencephalogram (EGM) characteristics: Rapid Eye Movement (REM) and non-REM (NREM). During the NREM cycle, there is an increase in the excitatory and inhibitory (E/I) balance, which increases neuroplasticity.[19] During the REM sleep cycle, on the other hand, there was a decrease in E/I balance, which caused a decrease in neuroplasticity, resulting in the stabilization process. Both of these are needed for optimizing the neuroplasticity process during sleep. Various synapse renormalization processes occur during sleep, which is beneficial to neuroplasticity and the learning process.[19]

In addition, the adenosine hormone that regulates sleep homeostasis helps the neuroplasticity process through the adenosine A1 receptor.[20] Seeing the important role of sleep in the neuroplasticity process, management of the wake-sleep cycle, and supportive therapy related to sleep disorders after brain injury can determine the patient's recovery process in the rehabilitation phase. In this study, the quality of life of female severe brain injury patients had a higher value than men. It can be caused because women have better sleep quality and efficiency than men.[21] In contrast, the elderly have a decrease in sleep quality as a result of the effects of aging. In addition, sleep disturbances in geriatric patients are found in 50% of the elderly, which impacts their decreasing quality of life in.[22]

Daily and social activities are also needed to support the neuroplasticity process so that the quality of life of patients with severe brain injury can return to normal after hospitalization. Kolb *et al.*, proved a 5% increase in brain weight and the number of synapses, angiogenesis, and the number and complexity of astrocytes in experimental animals exposed to an environment that stimulated socialization and activity for a month or more.[16] Given the importance of daily activities and social interactions in the rehabilitation process, intensive cognitive and physical therapy is required.

Complications that worsen the patient's quality of life are frequently experienced in patients with severe brain injuries. Common short-term complications are cognitive impairment, difficulty with sensory processing and communication, seizures, hydrocephalus, cerebrospinal fluid (CSF) leakage, cranial nerve or blood vessel injury, tinnitus, organ failure, and polytrauma. Psychiatric complications can also be found in the form of depression, mania, delirium, psychotic disorders, anxiety disorders, sleep disorders, and cognitive disorders, with age as a determining factor in the progression of these symptoms.[3]

This study found that the value of the physical and mental components was above the threshold value, 59.9 and 68.6 (respectively). This study also found that 80% of respondents had good mental component values and 53.3% had good physical component values. It concluded that any decrease in the function of a person's physical components would not necessarily decrease the value of a person's mental quality. In line Hu *et al.*, the value of the mental component is greater than the value of the physical component.[13] The mental component value is higher than the physical component because external factors

can help maintain the patient's mental health. According to Downing *et al.*, in addition to receiving adequate therapy, having a social support system also helps patients in the healing process.[23]

There are several weaknesses in this study. The first is the small population caused by poor medical records in the hospital. The location of samples is mostly outside of Surabaya, thus becoming an obstacle. Out of 1320 severely brain-injured patients hospitalized in Dr. Soetomo General Academic Hospital from 2018-2020, only 15 are contactable and became the samples of this study. The other weakness is the patients were given the questionnaire only once, so it is impossible to compare the quality of the patients when they are hospitalized and discharged.

CONCLUSION

Patients with severe brain injury at Dr. Soetomo General Academic Hospital, who had received therapy and had been discharged from the hospital, had a good quality of life. Patients' quality of life after being discharged from the hospital depends on many things, like their gender, age, sleep quality, and daily and social activity.

REFERENCES

1. Agarwal N, Thakkar R, Than K. Traumatic brain injury: Cause, symptoms, and treatments. American Association of Neurological Surgeons. 2020.
2. Dewan MC, Rattani A, Gupta S, Baticulon RE, Hung Y-C, Punchak M, et al. Estimating the global incidence of traumatic brain injury. *J Neurosurg*. 2018;130(4):1080–97.
3. Ahmed S, Venigalla H, Mekala HM, Dar S, Hassan M, Ayub S. Traumatic brain injury and neuropsychiatric complications. *Indian J Psychol Med*. 2017;39(2):114–21.
4. Bose P, Hou J, Thompson FJ. Traumatic brain injury (TBI)-induced spasticity: Neurobiology, treatment and rehabilitation. In: Kobesissy FH, editor. Brain Neurotrauma: Molecular, Neuropsychological, and Rehabilitation Aspects. CRC Press/Taylor & Francis; 2015.
5. Eaton H, Watson M. Transforming the path to recovery for brain injury: An integrated care model for chronic TBI and ABI patients. 2018.
6. Rezaei S, Khaksari Z. Validity and reliability of the short form health survey questionnaire (SF-36) for use in Iranian patients with traumatic brain injury (TBI). *Iran J Neurosurg*. 2019;5(2):79–91.
7. Polinder S, Haagsma JA, van Klaveren D, Steyerberg EW, van Beeck EF. Health-related quality of life after TBI: A systematic review of study design, instruments, measurement properties, and outcome. *Popul Heal Metrics*. 2015;13(4).
8. Cech D, Martin ST. Functional movement development across the life span. In: Evaluation of Function, Activity, and Participation. 3rd ed. Elsevier; 2011.
9. Rahman ARA, Rudiansyah M, Triawanti T. Hubungan antara adekuasi hemodialisis dan kualitas hidup pasien di RSUD Ulin Banjarmasin: Tinjauan terhadap pasien penyakit ginjal kronik yang menjalani hemodialisis rutin. *Berk Kedokt*. 2013;9(2):151–60.
10. Tandean S, Japardi J, Kollins F, Loe ML. Epidemiology of traumatic brain injury in neurosurgery department of tertiary referral hospital at North Sumatera, Indonesia. *Medicinus*. 2019;7(5):146–9.
11. Dhandapani SS, Manju D, Sharma BS, Mahapatra AK. Prognostic significance of age in traumatic brain injury. *J Neurosci Rural Pract* . 2012;3(2):131–5.
12. Modersitzki F, Pizzi L, Grasso M, Goldfarb DS. Health-related quality of life (HRQoL) in cystine compared with non-cystine stone formers. *Urolithiasis*. 2014;42(1):53–60.
13. Hu X-B, Feng Z, Fan Y-C, Xiong Z-Y, Huang Q-W. Health-related quality-of-life after traumatic brain injury: A 2-year follow-up study in Wuhan, China. *Brain Inj*. 2012;26(2):183–7.
14. Laskowitz D, Grant G. Translation research in traumatic brain injury. Boca Raton (FL): CRC Press/Taylor and Francis; 2016.
15. Arcos-Burgos M, Lopera F, Sepulveda-Falla D, Mastronardi C. Neural plasticity during aging. *Neural Plast*. 2019;2019:1–3.
16. Kolb B, Teskey GC, Gibb R. Factors influencing cerebral plasticity in the normal and injured brain. *Front Hum Neurosci*. 2010;4.
17. Park DC, Bischof GN. The aging mind: neuroplasticity in response to cognitive training. *Dialogues Clin Neurosci*. 2013;15(1):109–19.
18. Galea L, Uban KA, Epp JR, Brummelte S, Barha CK, Wilson WL, et al. Endocrine regulation of cognition and neuroplasticity: Our pursuit to unveil the complex interaction between hormones, the brain, and behaviour. *Can J Exp Psychol*. 2008;62(4):247–60.
19. Tamaki M, Wang Z, Barnes-Diana T, Guo D, Berard A V, Walsh E, et al. Complementary contributions of non-REM and REM sleep to visual learning. *Nat Neurosci*. 2020;23(9):1150–6.
20. Ma MW, Wang J, Zhang Q, Wang R, Dhandapani KM, Vadlamudi RK, et al. NADPH oxidase in brain injury and neurodegenerative disorders. *Mol Neurodegenration*. 2017;12(7):1–28.
21. Krishnan V, Collop NA. Gender differences in sleep disorders. *Curr Opin Pulm Med*. 2006;12(6):383–9.
22. Mazza M, Della Marca G, De Risio S, Mennuni GF, Mazza S. Sleep disorders in the elderly. *Clin Ter*. 2004;155(9):391–4.
23. Downing M, Hicks A, Braaf S, Myles D, Gabbe B, Cameron P, et al. Factors facilitating recovery following severe traumatic brain injury: A qualitative study. *Neuropsychol Rehabil*. 2021;31(6):889–913.

ATTACHMENT

Table 1. Demographic data of respondents to the SF-36 questionnaire at Dr.Soetomo General Academic Hospital

Demographic data	N	%
Age		
- Adult (18-64)	13	86.7
- Elderly (>65)	2	13.3
Gender		
- Male	10	66.7
- Female	5	13.3

Table 2. The final value of each domain as well as the physical and mental components

Final Score	Average ±SD
Pysical function (0-100)	58,2±36.8
Physical limitation (0-100)	46.7±26.5
Body pain (0-100)	73.6±26.5
General health (0-100)	61.3±28.1
Vitality (0-100)	65.3±22.2
Social function (0-100)	72.5±25.5
Emotional limitations (0-100)	60.0±36.1
Mental health (0-100)	76.5±16.6
Physical components (0-100)	59.9±31.1
Mental components (0-100)	68.6±26.1

Table 3. Interpretation of every domain and component from each respondent

Category	Primary Data	Interpretation
Pysical function	58.2	Good
Physical limitation	46.7	Bad
Body pain	73.6	Good
General health	61.3	Good
Vitality	65.3	Good
Social function	72.5	Good
Emotional limitations	60.0	Good
Mental health	76.5	Good
Physical components	59.9	Good
Mental components	68.6	Good

Table 4. Overview of the quality of life of severe brain injury patients at Dr. Soetomo General Academic Hospital based on demographic data

Demographic data	Physical Components	Mental Components
Age		
- Adult (18-64)	60.5	65.1
- Elderly (>65)	56.6	69.1
Gender		
- Male	47.2	53.7
- Female	57.6	66.2

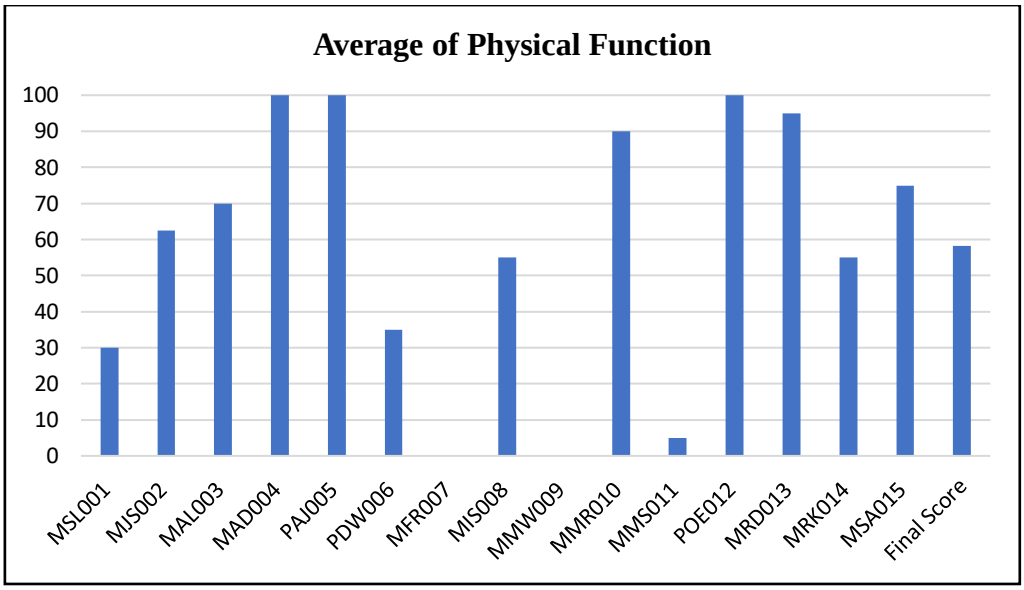

Figure 1. Distribution of physical function domain values of each respondent

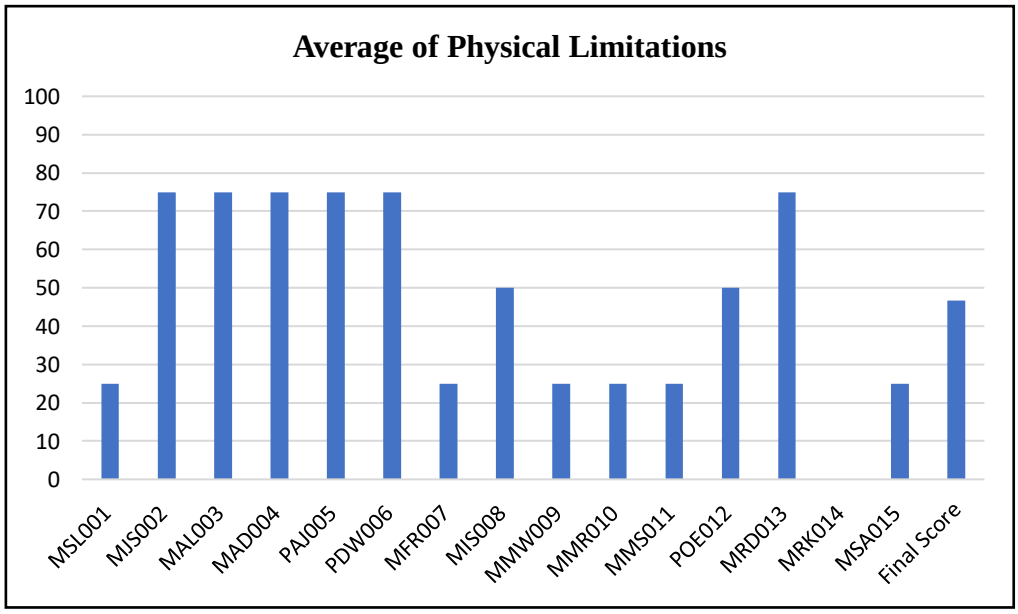

Figure 2. Distribution of physical limitations domain values of each respondent

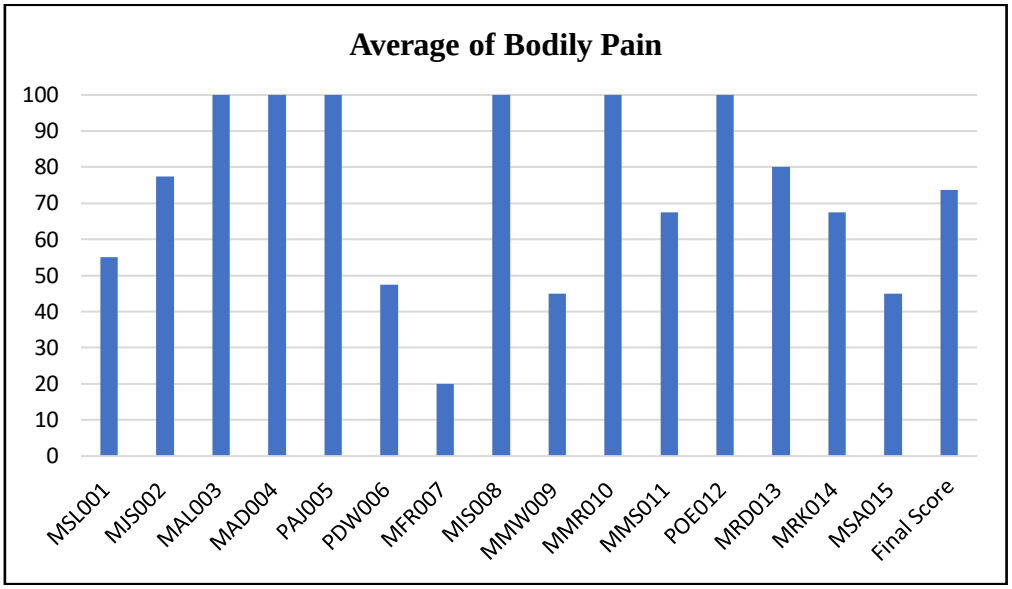

Figure 3. Distribution of body pain domain values of each respondent

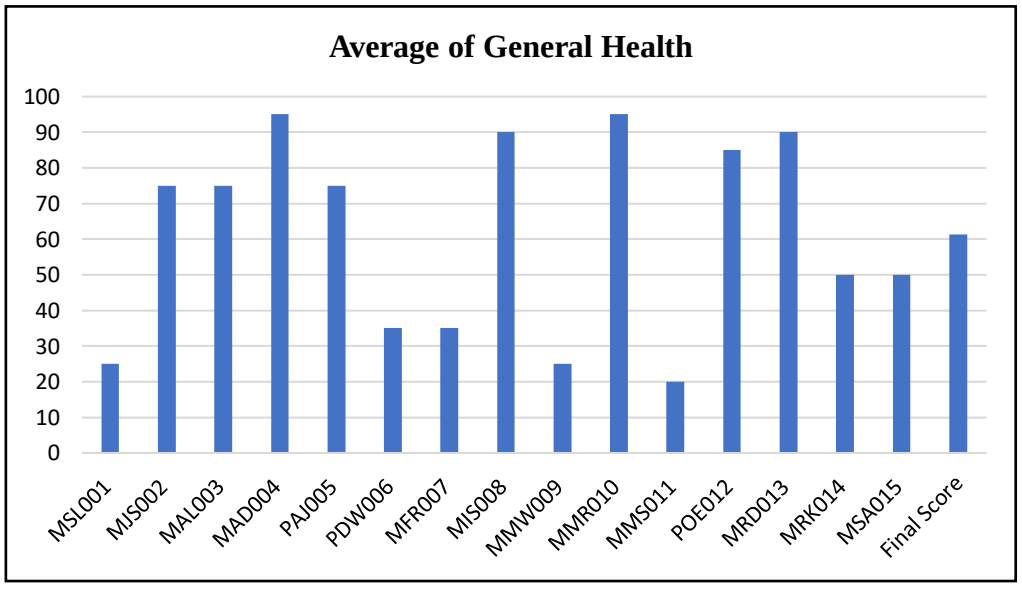

Figure 4. Distribution of general health domain values of each respondent

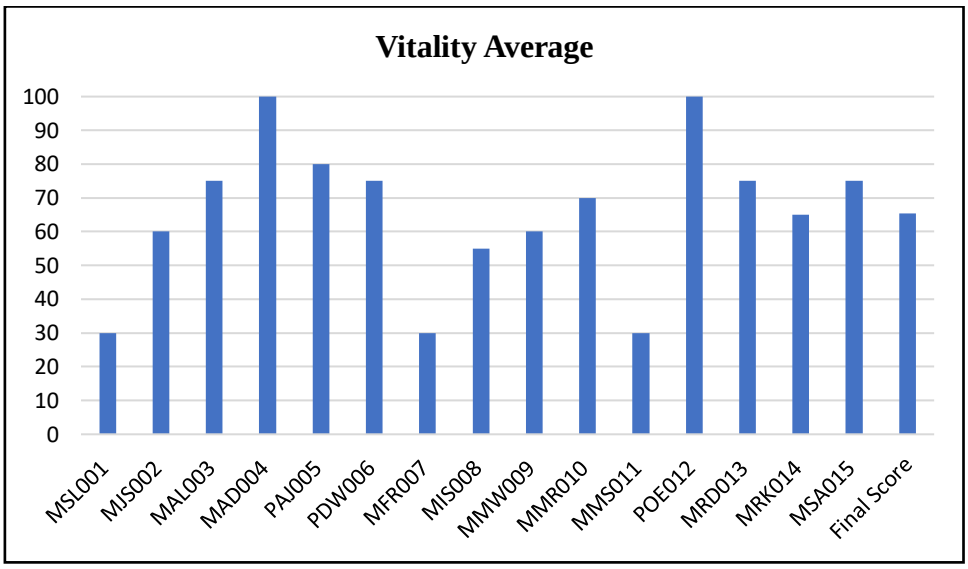

Figure 5. Distribution of vitality domain values of each respondent

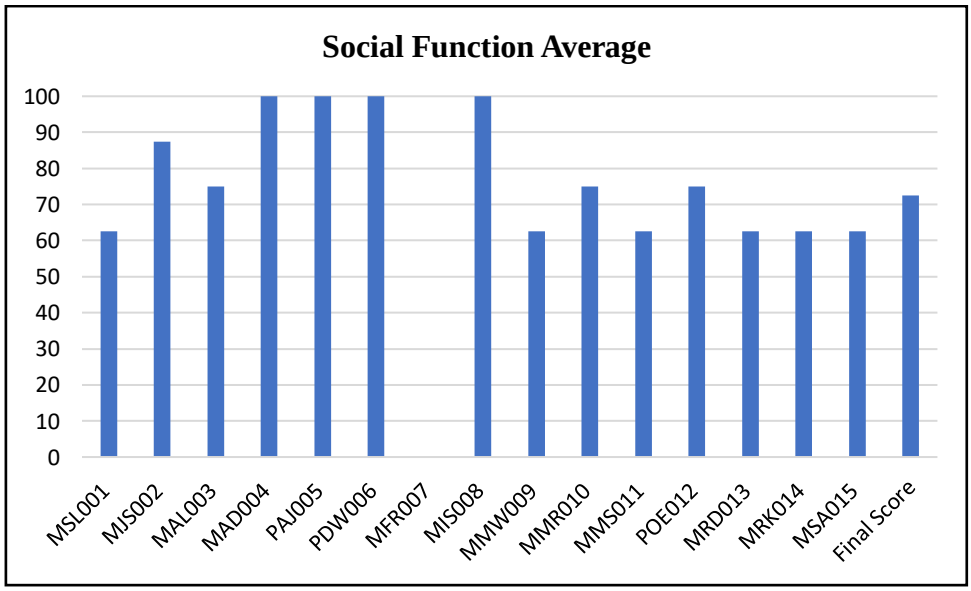

Figure 6. Distribution of social function domain values of each respondent

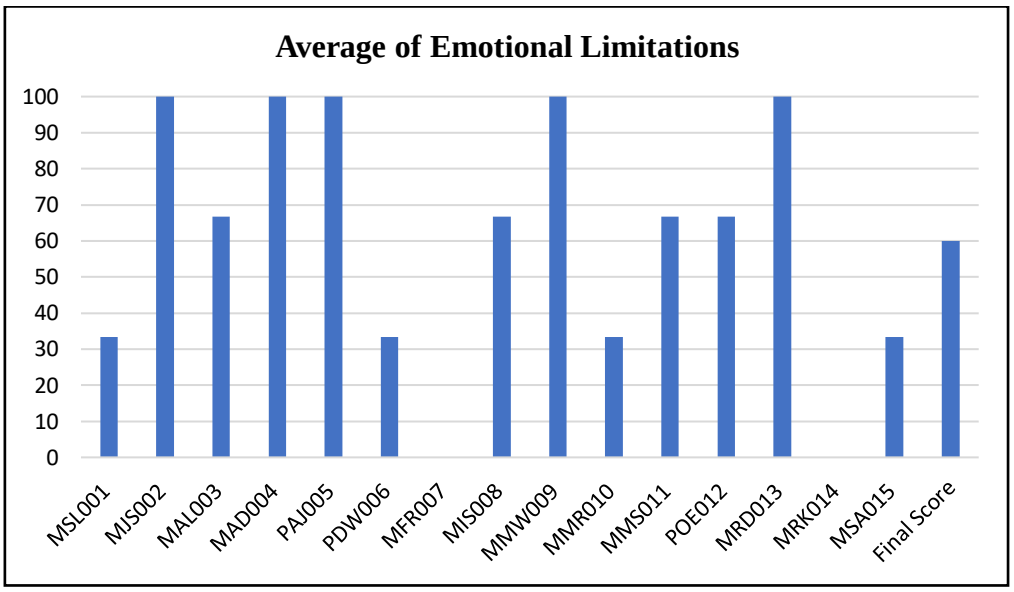

Figure 7 Distribution of emotional limitation values of each respondent

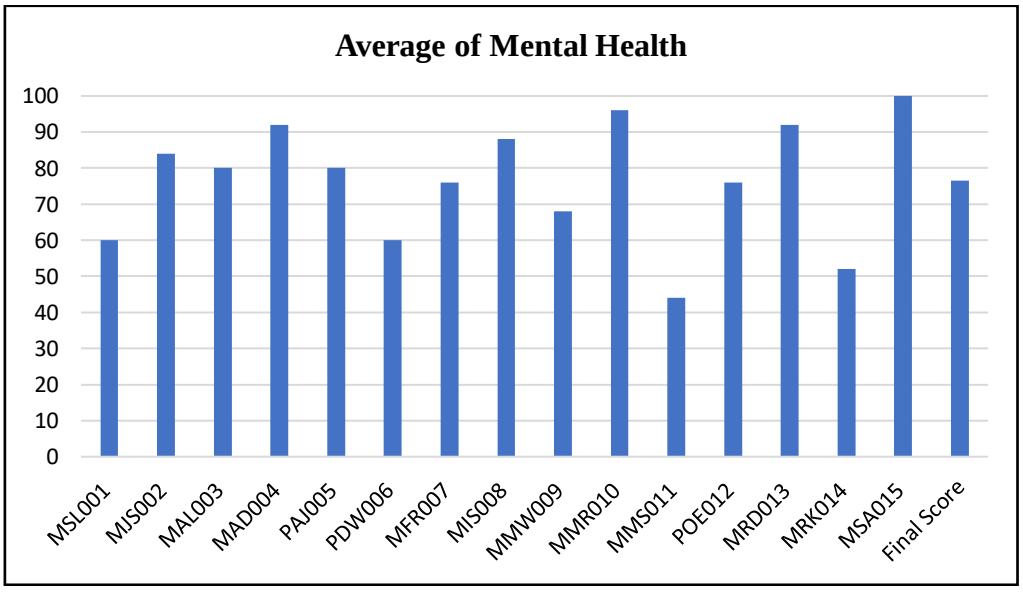

Figure 8. Distribution of mental health values of each respondent