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Literature Reviews on Orthostatic Hypotension and Its Effect on the Quality of Life of the Elderly

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Abstract
The substantial drop in blood pressure that happens when a person moves from a seated or supine position to a standing one is known as orthostatic hypotension (OH). At least 10 mmHg in diastolic blood pressure or 20 mmHg in systolic blood pressure has been dropped. Because OH causes neurodegenerative abnormalities of the autonomic nervous system and decreased baroreceptor sensitivity, it is one of the diseases that increases morbidity and death in the aged. This decline in physical, psychological, and cognitive functions affects the quality of life of the elderly. The life quality index for person with OH and non-OH significantly differs in several aspects including physical, psychological, independence, pain, and discomfort in performing daily activities. Hence, realizing this issue, this literature review particularly aims to assess the current state and advancements in the management of OH.

Keywords: Review, Orthostatic Hypotension, Elderly, Quality of Life

1. Research Background

Orthostatic hypotension (OH) refers to the substantial drop in blood pressure that appears when a person alters position from lying or sitting to standing. This drop in blood pressure is at least 20 mmHg in systolic blood pressure or at least 10 mmHg in diastolic blood pressure (Magkas *et al.*, 2019). OH is a common health issue found in the elderly. As we age, changes in various bodily systems become more frequent. Many changes lead to a decrease in the function of various organ systems. OH is one of the many diseases that cause morbidity and mortality in the elderly (Nurullita, 2015). OH can be detected by quantify blood pressure after an individual has been in a supine position for five minutes, followed by measuring it again three minutes after moving to a standing position (Kim and Farrell, 2022).

Orthostatic hypotension is generally occur in the elderly. It is related to the reduced baroreflex response, decreased cardiac compliance, and weakness of vestibulosympathetic reflexes. The elderly who live in their own homes or with family tend to have lower rates of orthostatic hypotension, around 6%. Whereas, the elderly who live in healthcare facilities, such as nursing homes or similar facilities, have a much higher rate of OH incidence, between

54% and 68%. This could be due to various health conditions and medications commonly used in such care facilities (Freeman, 2008).

Orthostatic hypotension often becomes the cause of admission of elderly patients to hospital. Approximately a quarter of patients who come to the emergency department for fainting have orthostatic hypotension. About 36 out of every 100,000 adults require hospitalization due to orthostatic hypotension. This number can increase 233 out of every 100,000 patients over the age of 75. The hospital mortality rate from this condition is 0.9%. About 60% of hospitalized elderly patients have orthostatic hypotension. Moreover, this condition is also an indicator of the increased risk of death in patients (Palma and Kaufmann, 2017).

1.1 Etiology

The causes of orthostatic hypotension are categorized into two types: primary and secondary. Primary orthostatic hypotension is uncommon and typically results from pure autonomic failure, multiple system atrophy, Parkinson's disease, and other severe neurodegenerative diseases. Secondary orthostatic hypotension, on the other hand, is more prevalent and can be brought on by a number of contributing factors, including the usage of specific drugs, dehydration, vein buildup, heart problems, diabetes, renal failure, autoimmune diseases, and endocrine disorders. (Tzur, Izhakian and Gorelik, 2019).

There are two types of orthostatic hypotension: neurogenic and non-neurogenic. Medication use may also be a contributing factor. Autonomic nervous system instability brought on by neuropathic, neurodegenerative, or aging conditions is known as neurogenic orthostatic hypotension. Diabetes, cholinergic receptor autoantibodies, and familial dysautonomia are examples of neuropathic causes. Parkinson's disease, multiple system atrophy, and pure autonomic failure are examples of neurodegenerative factors. Conversely, a drop in blood volume brought on by dehydration frequently causes non-neurogenic orthostatic hypotension. Additionally, it is also necessary to consider orthostatic hypotension that can be triggered by the use of antihypertensive drugs, especially in polypharmacy situations in the elderly (Ringer M, 2023) (Ricci, De Caterina and Fedorowski, 2015).

Orthostatic hypotension, resulting from the use of certain medications, accounts for about 1.3% of adverse drug reactions, particularly in the elderly. This is caused by drugs that can interfere with the body's response to changes in position, for example by reducing vasoconstriction or increasing venous build-up. Elderly people are more prone to this condition due to the physical changes that occur with age, which can affect the way their body processes drugs. The elderly are also more susceptible to orthostatic hypotension due to other factors like concurrent illnesses, taking many drugs at once, and a decline in physical fitness.(Rivasi *et al.*, 2020).

1.2 Risk Factors

Atrial fibrillation 5.9%, diabetes mellitus 22%, and hypertension 60% are risk factors for orthostatic hypotension in the elderly. The prevalence of orthostatic hypotension in the elderly should receive particular attention because it may raise their risk of falling. (Ga Mudamakin, Aryana, and Suastika, 2018).

Age is the primary cause of orthostatic hypotension. At age ≥70 years, the prevalence of orthostatic hypotension rises from less than 5% in the fifth decade of life to 20%. Carotid artery disease, diabetes, Parkinson's disease, and hypertension are additional risk factors. The autonomic processes that control blood pressure may be hampered by any of these risk factors. In particular, under these circumstances, baroreflex function is reduced (Shibao and Biaggioni, 2010).

As people age, orthostatic hypotension becomes more common. In middle-aged persons, it can vary from 5 to 10%, while in those over 60, it can surpass 20%. Although the exact cause of the higher prevalence of orthostatic hypotension in the elderly is still unknown, potential causes include an increased risk of autonomic nerve disease, the use of numerous medications that exacerbate the condition, poor nutrition, deteriorating physical health, and

age-related changes in the body, such as a less-than-ideal reaction to changes in body position and nerve damage that frequently happens with aging. (Lei, Chew and Raj, 2020).

Orthostatic hypotension commonly occurs in women due to biological and physiological differences that affect the body's response to changes in position. Women tend to have smaller bodies, including a smaller heart, which can affect the heart's ability to maintain blood circulation when standing. Moreover, the lower Center Of Gravity (COG) in women causes blood accumulation in the lower part of the body, interfering with blood circulation back to the heart when standing. Responses of the autonomic nervous system in women to changes in body position also tend to be less efficient, which can lead to a rapid drop in blood pressure. Hormonal changes, such as during menopause, also have the potential to affect the body's response to blood pressure and overall heart function. These factors combined increase women's susceptibility to orthostatic hypotension when compared to men (Cheng *et al.*, 2011). Orthostatic hypotension affects around 10.7% of the elderly, and up to 30% of outpatients over 65 have the condition. Epidemiological research findings indicate that orthostatic hypotension is frequently linked to myocardial infarction, Parkinson's disease, short-lived stroke episodes, high blood pressure, and aberrant ECG readings. Conversely, the prevalence of orthostatic hypotension is only around 7% in older adults who are healthy, have normal blood pressure, and have no other risk factors.(Potocka-Plazak and Plazak, 2001).

1.3 Epidemiology

As people age, orthostatic hypotension becomes more common. Patients 65 years of age and older are more likely to have the condition, which is partially brought on by a loss in baroreceptor sensitivity. Orthostatic hypotension was identified in 5% of people aged 45–49, 15% of people aged 65–69, and over 25% of people aged 85 and older, according to two large-scale investigations carried out in the United States (Ringer M, 2023). 12.6% of Indonesians aged 40 years and above experience orthostatic hypotension (Setiati and Prodjosudjadi, 2004).

In the ARIC (Atherosclerosis Risk In Communities) study, which included a prospective cohort of 15,792 middle-aged adults between the ages of 45 and 64, it was discovered that approximately 5% of the participants had orthostatic hypotension. About 30% of people with type 1 diabetes and 25% to 30% of people with type 2 diabetes suffer with orthostatic hypotension, a prevalent symptom in diabetic patients. Up to 64% of these patients may have orthostatic hypotension when they need to be admitted to the hospital (Freeman *et al.*, 2018). The prevalence of orthostatic hypotension in adults aged 40 years and above in Indonesia reached 12.6% (Setiati and Prodjosudjadi, 2004).

The prevalence of orthostatic hypotension in the elderly in China is 0.76%, which is much lower than the rates reported in other countries. For example, a study in Malaysia showed a hypotension prevalence rate of 29.3% in community-dwelling elderly, while in Estonia, the prevalence was 11.1% in people aged 65 years and above who had orthostatic hypotension. The large difference in prevalence rates may also be due to differences in the definition of hypotension. The prevalence rate of orthostatic hypotension showed a significant difference between men and women, with women having a higher rate of 27.95% compared to men at 14.46%. This indicates a greater tendency for women to experience the condition of orthostatic hypotension compared to men. However, the correlation between gender and cognitive impairment is still debatable. This may be related to the decrease in estrogen levels in the female body after menopause (Zhu *et al.*, 2016).

1.4. Pathophysiology

Reduced blood pressure is the outcome of orthostatic hypotension, which happens when blood vessels are unable to adapt to the position change from lying to standing. This is brought on by alterations in the blood arteries and a reduction in the amount of blood that pools in the lower body. As a result, there is less blood flowing to the brain, which makes the blood vessels less effective at responding to the brain's need for more blood flow (Nurullita, 2015).

The autonomic nervous system, which helps to keep blood flowing to the heart, leg muscle contractions, and other intricate processes are all part of the body's reaction to standing. When blood pressure falls, the body's baroreceptors sense it and alert the brain to raise sympathetic nerve activity. In order to keep blood flowing to the brain, this causes vasoconstriction and an elevated heart rate. Disturbances in the autonomic nervous system prevent this compensatory mechanism in neurogenic orthostatic hypotension, which results in a prolonged reduction in cardiac output and may cause syncope and brain hypoperfusion. Orthostatic hypotension in the elderly is frequently caused by neurodegenerative diseases, including multi-system atrophy, Parkinson's disease, and Lewy body dementia. Moreover, autonomic nerve abnormalities that lead to orthostatic hypotension can also be brought on by diabetes, HIV, and a few other illnesses (Dani *et al.*, 2021).

1.5 Diagnosis

Blood pressure is measured using a blood pressure measuring device following the standard. Measurements are taken twice in a lying position and an upright sitting position. Blood pressure measurement while lying down is performed after the patient has rested for 10 minutes in a lying position. The arm is kept in a horizontal position during the measurement. When blood pressure drops by at least 20 mmHg in the systolic or at least 10 mmHg in the diastolic within three minutes of standing up from a sitting or reclining posture, orthostatic hypotension is diagnosed(Setiati and Prodjosudjadi, 2004) (Robertson, 2008).

1.6 Supporting Examination

Supporting examination to identify orthostatic hypotension involves a series of important measures. These include laboratory tests to measure blood components such as hemoglobin, electrolytes, glucose, creatinine and thyroid hormone (TSH). Cardiovascular health is assessed through electrocardiogram (ECG) recording, long-term monitoring with telemetry or Holter-ECG, as well as echocardiographic examination for visual images. Furthermore, an ECG during physical exercise is also performed. If needed, brain imaging is performed to gain a deeper understanding of the neurological condition, especially when there is a history of head trauma or neurological symptoms that need to be examined. All of these steps aim to provide a comprehensive insight into the patient's condition (Ricci, De Caterina and Fedorowski, 2015).

1.7 Management

The management approach for patients is mostly determined by the etiology. Relieving symptoms and avoiding negative health outcomes are the primary objectives of treatment. The literature indicates that, with the exception of Parkinson's disease, people who do not exhibit symptoms are usually left without specialized therapy. Due to their increased risk of falls and declining quality of life, these individuals require screening. Eliminating the cause and improving the treatment strategy are the initial steps for individuals with drug-use-related illnesses. In order to treat diseases like diabetes, hypertension, Parkinson's disease, and others, a multidisciplinary approach is frequently necessary. Patients who are dehydrated require prompt volume resuscitation. The use of abdominal belts, compression stockings on the legs, the significance of drinking enough water, monitoring salt intake, and fall prevention techniques are all necessary for patients with orthostatic hypotension brought on by neurogenic causes. Non-pharmacological methods have proven successful in treating this illness. (Ringer M, 2023).

Non-pharmacological approaches

Several non-pharmacological measures can be taken to manage orthostatic hypotension (Ringer M, 2023), including:

a. Make slow and gradual changes in body position when moving from lying to sitting, and then standing. Avoid sudden changes in position.
b. Ensure the body stays hydrated with enough fluids.
c. Avoid alcohol, hot environments, heavy meals, and hot baths that can affect blood pressure.
d. Raising the head of the bed as you sleep can help lower your risk of hypotension
e. Do an exercise program to maintain physical health.

f. After standing up, gradually strengthen the muscles of the legs and hips.
g. Use compression on the lower extremities.
h. In order to prevent hypotension, consider to using an abdominal binder

Pharmacological approaches
Pharmacological treatment is recommended after non-pharmacological interventions are deemed to have failed in reducing symptoms. Consequently, a pharmacological treatment approach becomes relevant. Fludrocortisone and midodrine remain the main options, along with other pharmacologic therapies such as pyridostigmine. Midodrine serves as an alpha-1 agonist, pyridostigmine as an acetylcholinesterase inhibitor, and fludrocortisone as an aldosterone analog. Each of these three medications increases vascular tone in a different way. The current study's findings demonstrate that midodrine is more effective than pyridostigmine at reducing symptoms. Midodrine's efficacy against other forms of orthostatic hypotension is unknown, though, and it is only advised for individuals with orthostatic hypotension brought on by autonomic dysfunction. Another option for treating orthostatic hypotension is droxidopa, though further research is needed to confirm its efficacy. (Ringer M, 2023).

1.8. Prognosis

Although frequently asymptomatic or with only mild symptoms, orthostatic hypotension increases the risk of death and the likelihood of heart attack, heart failure, stroke, and heart rhythm disorders. Heart and vascular disease may also explain why there is an increased risk of death associated with orthostatic hypotension, as it is associated with heart attacks, brief ischemic attacks, abnormalities in electrocardiogram recording, and narrowing of the carotid arteriesWhen the heart is at rest, blood passes through the left coronary artery. Consequently, when the heart is at rest, coronary blood flow may be decreased in patients with orthostatic hypotension, which could ultimately lead to poor survival chances (Ringer M, 2023). No studies have yet revealed whether treatment for orthostatic hypotension can improve the prospects of recovery. However, comorbid conditions that often occur in patients with orthostatic hypotension are realized to also increase the risk of heart problems, especially diabetes and hypertension. Therefore, it is imperative that strategies to reduce orthostatic hypotension need to be carried out with caution to avoid worsening these additional disease conditions (Wieling *et al.*, 2022).

2. Discussion

Commonly, after entering the elderly phase, an individual tends to experience a decline in cognitive and psychomotor functions. Cognitive functions include processes such as learning, perceiving, understanding, comprehending, focusing, and others, resulting in slower reactions and behavior of the elderly. Meanwhile, psychomotor functions include aspects related to movement control and coordination of actions, thus the elderly become less dexterous in their activities (Kesehatan et al., 2019).

The decline in physical, psychological and cognitive functions occurred in the elderly with OH can reduce the level of health and potentially affect their quality of life. The elderly level of health and quality of life are perceptions of well-being related to health, personal independence, status and the role of individuals in the community. Measuring the level of quality of life in the elderly can be done by evaluating the impact of medical conditions on the well-being felt by the elderly (Cheng et al., 2023). In a research conducted by Kin et al. (2020), it is also stated that the quality of life index of individuals with OH and non-OH significantly differs in the aspects of physical, psychological, independence, pain, and discomfort in carrying out daily activities (Kim et al., 2020).

In physical and psychological aspects, the elderly groups with OH and non-OH are significantly different. Influencing aspects include the presence of OH symptoms that can increase levels of anxiety and depression. The types and occurrences of orthostatic symptoms are dizziness, fatigue, memory decline, difficulty concentrating, blurred vision, vibration sensation, vertigo, pale facial skin, feelings of anxiety, increased heart rate, cold and moist skin, and nausea. When the elderly groups with OH and non-OH are compared, the elderly group with OH has quite extreme problems from these variables (Kim et al., 2020).

In previous research by Moon et al. (2016), each orthostatic symptom has a clinically significant difference.

Moreover, patients with orthostatic intolerance can experience depression and decreased quality of life that tends to be excessive, including those with minimal symptoms (Moon et al., 2016).

Patients with OH are mostly people with older age, lower education, and more comorbidities (Kim et al., 2020). As it is commonly known, older people will experience a decrease in physiological function. This decrease in physiological function will certainly affect an individual's quality of life in all aspects. Low education can also affect an individual's level of health. FCT (Fundamental Cause Theory) argues that social factors such as education are 'fundamental' causes of health and disease because they determine access to many material and non-material resources such as income, a safe environment, or a healthier lifestyle, all of which have the effect of protecting or improving health (Zajacova & Lawrence, 2018). By realizing a disease, which in this context is OH, starting from preventive, curative, and rehabilitative stages, it is expected that individuals can take care of themselves from the disease, thus they can live more prosperously in their old age. Along with the aging process, individuals will also face challenges from a number of other diseases, especially those that are degenerative such as dementia, hypertension, stroke and DM. OH itself is often associated with an increased risk of death in a number of populations (Fedorowski et al., 2014) (Zhu et al., 2016). The lower comorbidity levels in individuals with OH will also reduce its impact, thus lessening its effect on the quality of life of the elderly (Ricci, Fedorowski, et al., 2015).

Orthostatic hypotension (OH) frequently occurs in frail elderly individuals and can be caused by various medical conditions, such as decreased intravascular volume, varicose veins, severe anemia, antihypertensive therapy, and decreased physical function. The prevalence of OH commonly increases in patients over >65 years, although only 2% of them show symptoms (Raber et al., 2022). When OH occurs in middle-aged patients without volume depletion or drug effects, the OH encountered is usually neurogenic due to impaired norepinephrine release from sympathetic postganglionic neurons. This occurs in about one-third of patients with OH. Neurogenic OH is best understood as a neurotransmitter disorder and this condition has a fairly high prevalence in the United States, occurring in less than 200,000 people. Nonetheless, the prevalence of neurogenic orthostatic hypotension may be underestimated, as blood pressure measurements are not always taken in an upright position (Palma & Kaufmann, 2017).

3. Conclusion

Orthostatic hypotension in the elderly is a common condition and affects their quality of life. Therefore, accurate diagnosis of the disease is crucial, by considering safety, effectiveness, individual traits, and a multidisciplinary approach as the key to enabling the elderly to live a healthy, high-quality life.

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References

Andi Kasrida Dahlan, A. St. Umrah, and Tenri Abeng (2018) *HEALTH OF THE ELDERLY: A Study of Gerontology Theory and Care Approaches for the Elderly*. Intimedia. Available at: https://www.researchgate.net/publication/340978922.

Cheng, Y.-C. *et al.* (2011) 'Gender Differences in Orthostatic Hypotension', *The American Journal of the Medical Sciences*, 342(3), pp. 221–225. Available at: https://doi.org/10.1097/MAJ.0b013e318208752b.

Dani, M. *et al.* (2021) 'Orthostatic hypotension in older people: considerations, diagnosis and management', *Clinical Medicine*, 21(3), pp. e275–e282. Available at: https://doi.org/10.7861/clinmed.2020-1044.

Farrell, M.C. and Shibao, C.A. (2020) 'Morbidity and mortality in orthostatic hypotension', *Autonomic Neuroscience*, 229, p. 102717. Available at: https://doi.org/10.1016/j.autneu.2020.102717.

Fedorowski, A. *et al.* (2022) 'Orthostatic Hypotension: Management of a Complex, But Common, Medical Problem', *Circulation: Arrhythmia and Electrophysiology*, 15(3). Available at: https://doi.org/10.1161/CIRCEP.121.010573.

Fedorowski, A., Wahlstrand, B., Hedner, T., & Melander, O. (2014). Systolic and diastolic component of orthostatic hypotension and cardiovascular events in hypertensive patients. *Journal of Hypertension*, *32*(1), 75–81. https://doi.org/10.1097/HJH.0b013e328365cd59

Freeman, R. (2008) 'Neurogenic Orthostatic Hypotension', *The new england journal of medicine* [Preprint].

Freeman, R. *et al.* (2011) 'Consensus statement on the definition of orthostatic hypotension, neurally mediated syncope and the postural tachycardia syndrome', *Clinical Autonomic Research*, 21(2), pp. 69–72. Available at: https://doi.org/10.1007/s10286-011-0119-5.

Freeman, R. *et al.* (2018) 'Orthostatic Hypotension', *Journal of the American College of Cardiology*, 72(11), pp. 1294–1309. Available at: https://doi.org/10.1016/j.jacc.2018.05.079.

Ga Mudamakin, J.R., Aryana, I.S. and Suastika, R.T.K. (2018) 'The risk of orthostatic hypotension in geriatric patients with hypertension in Pedawa Village, Banjar District, Singaraja Regency, Bali Province', *Medicina*, 49(2). Available at: https://doi.org/10.15562/medicina.v49i2.281.

Kesehatan, J., Kalimantan, P. B., Rahmadhani, S., & Wulandari, A. (2019). *Overviews on the Quality of Life of the Elderly in Bhuana Jaya Village, Tenggarong Seberang* (Vol. 2, Issue 2). http://e-journals.unmul.ac.id/index.php/JKPBK

Kim, M.J. and Farrell, J. (2022) 'Orthostatic Hypotension: A Practical Approach', 105(1).

Lei, L.Y., Chew, D.S. and Raj, S.R. (2020) 'Differential diagnosis of orthostatic hypotension', *Autonomic Neuroscience*, 228, p. 102713. Available at: https://doi.org/10.1016/j.autneu.2020.102713.

Magkas, N. *et al.* (2019) 'Orthostatic hypotension: From pathophysiology to clinical applications and therapeutic considerations', *The Journal of Clinical Hypertension*, 21(5), pp. 546–554. Available at: https://doi.org/10.1111/jch.13521.

Moon, J., Kim, D. Y., Byun, J. I., Sunwoo, J. S., Lim, J. A., Kim, T. J., Shin, J. W., Lee, W. J., Lee, H. S., Jun, J. S., Park, K. Il, Jung, K. H., Lee, S. T., Jung, K. Y., Chu, K., & Lee, S. K. (2016). Orthostatic intolerance symptoms are associated with depression and diminished quality of life in patients with postural tachycardia syndrome. *Health and Quality of Life Outcomes*, *14*(1). https://doi.org/10.1186/s12955-016-0548-x

Nurullita, T. (2015) 'DIFFERENCES IN TIME OF REACTION OF THE ELDERLY WITH ORTHOSTATIC HYPOTENSION AND WITHOUT ORTHOSTATIC HYPOTENSION'.

Palma, J.-A. and Kaufmann, H. (2017) 'Epidemiology, Diagnosis, and Management of Neurogenic Orthostatic Hypotension', *Movement Disorders Clinical Practice*, 4(3), pp. 298–308. Available at: https://doi.org/10.1002/mdc3.12478.

Pasina, L. *et al.* (2020) 'Orthostatic hypotension among elderly patients in Italian internal medicine wards: an observational study', *Internal and Emergency Medicine*, 15(2), pp. 281–287. Available at: https://doi.org/10.1007/s11739-019-02172-7.

Potocka-Plazak, K. and Plazak, W. (2001) 'Orthostatic hypotension in elderly women with congestive heart failure', *Aging Clinical and Experimental Research*, 13(5), pp. 378–384. Available at: https://doi.org/10.1007/BF03351506.

Raber, I., Belanger, M. J., Farahmand, R., Aggarwal, R., Chiu, N., Al Rifai, M., Jacobsen, A. P., Lipsitz, L. A., & Juraschek, S. P. (2022). Orthostatic Hypotension in Hypertensive Adults: Harry Goldblatt Award for Early Career Investigators 2021.*Hypertension*, *79*(11),2388–2396. https://doi.org/10.1161/HYPERTENSIONAHA.122.18557

Ricci, F., De Caterina, R. and Fedorowski, A. (2015) 'Orthostatic Hypotension', *Journal of the American College of Cardiology*, 66(7), pp. 848–860. Available at: https://doi.org/10.1016/j.jacc.2015.06.1084.

Ringer M, L.S. (2023) 'Orthostatic Hypotension', *StatPearls Publishing* [Preprint]. Available at: https://www.ncbi.nlm.nih.gov/books/NBK448192/.

Rivasi, G. *et al.* (2020) 'Drug-Related Orthostatic Hypotension: Beyond Anti-Hypertensive Medications', *Drugs & Aging*, 37(10), pp. 725–738. Available at: https://doi.org/10.1007/s40266-020-00796-5.

Robertson, D. (2008) 'The pathophysiology and diagnosis of orthostatic hypotension', *Clinical Autonomic Research*, 18(S1), pp. 2–7. Available at: https://doi.org/10.1007/s10286-007-1004-0.

Setiati, S. and Prodjosudjadi, W. (2004) 'Prevalence of orthostatic hypotension and its risk factors in the adult population aged 40 years and over in Indonesia', 13.

Shibao, C. and Biaggioni, I. (2010) 'Orthostatic Hypotension and Cardiovascular Risk', *Hypertension*, 56(6), pp. 1042–1044. Available at: https://doi.org/10.1161/HYPERTENSIONAHA.110.162768.

Sugiyono (2013). *QUANTITATIVE-QUALITATIVE AND R & D RESEARCH METHODS*. Alfabeta bandung.

Tzur, I., Izhakian, S. and Gorelik, O. (2019) 'Orthostatic hypotension: definition, classification and evaluation', *Blood Pressure*, 28(3), pp. 146–156. Available at: https://doi.org/10.1080/08037051.2019.1604067.

Wieling, W. *et al.* (2022) 'Diagnosis and treatment of orthostatic hypotension', *The Lancet Neurology*, 21(8), pp. 735–746. Available at: https://doi.org/10.1016/S1474-4422(22)00169-7.

Zajacova, A., & Lawrence, E. M. (2018). The Relationship Between Education and Health: Reducing Disparities Through a Contextual Approach. *Annual Review of Public Health*, *39*(1), 273–289. https://doi.org/10.1146/annurev-publhealth-031816-044628

Zhu, Q. *et al.* (2016) 'Orthostatic hypotension: prevalence and associated risk factors among the ambulatory elderly in an Asian population', *Singapore Medical Journal*, 57(8), pp. 444–451. Available at: https://doi.org/10.11622/smedj.2016135.