

# Responsibility of Neuromuscular Diseases in Affecting the Function of Muscles Due To Problems with the Nerves and Muscles in the Body

**Dr. Harshika Gupta**

NIMS University, Jaipur, Rajasthan, India

Corresponding Author Email: harshika8874gupta@gmail.com

---

## Abstract

*This article is based on the Neuromuscular disease that can be responsible for the various kinds of issues such as muscle loss, muscle weakness, and many more. This disease may occur from genetic mutation viral infections, autoimmune disorders, and metabolic disorders. This study also highlighted the process of affecting muscle functions and their connection with the body. On the other hand, this study also shed light on the impact of neuromuscular disease on the peripheral nervous system which is more essential for the body. It consists of motor and sensory nerves that can connect the entire body with the brain and spinal cord. Neuromuscular disease is also responsible for hampering the daily lifestyle and also responsible for reducing a person's quality of life. This study has chosen a secondary qualitative method that helps to get worldwide data and also makes an impact on the whole research study. In order to apply this study helps to know about the effectiveness of neuromuscular disease. There are different types of neuromuscular diseases that make an impact on daily activities such as eating, walking, climbing, and other activities. Sometimes this disease also makes negative effects on the skill of learning. RNA proteins play a significant role in neuromuscular disease that is connected with chromosomes, genes, and DNA as well. TDP43 plays a critical role in the function of skeletal muscles and sometimes it is also responsible for neuromuscular disease.*

## Keywords

*Neuromuscular disease, control voluntary muscles, spinal muscular atrophy, Junction of neuromuscular, NMDS, TDP43, RNA, FUS, ESW, RBP.*

---

## INTRODUCTION

Function of muscles is affected due to neuromuscular disease that makes muscle weakness. Several causes are responsible for causing this disease in the human body and genetic mutation, autoimmune disorder, viral infections and metabolic disorder are the causes of this disease. Multiple symptoms such as botulism, amyotrophic lateral sclerosis, congenital myasthenic syndrome, muscular dystrophy and myasthenia are shown among the people who are affected by this disease. Most botulism occurs through the attack of toxins on the nerve of the human body. This symptom is considered life threatening and in most of the cases food is responsible for entering bacteria of this disease. Defect in the junction where both nerve and muscles stimulate actively.

Both nerve and muscle cells are affected through these defects and as a result issues of neuromuscular disease are happening. This disease mostly affects muscles and most of the muscles become weak and for this reason the muscles lose their ability to operate the human body smoothly. Several issues happen due to issues in muscles and the issues are such as difficulty in moving, numbness and swallowing problems. Physical strength of the human body is badly affected that reduces the ability of humans to do regular work. On the other hand, damage to nerves affects movement of human body parts. One cannot move body parts properly due to damaging nerves. In this study, wide discussion on the

responsibility of neuromuscular disease to affect function of muscles with the issue of nerve and muscles are to be described.

## LITERATURE REVIEW

### Concept of Neuromuscular diseases that affects muscular function

Neuromuscular disease is a wide range of diseases that can affect the peripheral nervous system. Accordingly, it consists of all the sensory and motor nerves that are connected with the spinal cord and brain to the rest of the body. Muscle weakness is one of the predominant situations or conditions of these kinds of disorders. Neuromuscular disease can occur due to spontaneous mutation of genes and also can happen due to various immune system disorders. This disease affects muscle functions due to issues with the muscles and nerves in the body. Muscle weakness is one of the most common symptoms of this disease [1]. On the other hand, it can be said that this disease is not curable and better treatments are able to manage the symptoms. There are different kinds of therapies that can improve the lifespan of patients and develop their quality of life. In this context, it has been seen that patients suffer from various deficiencies of the neural connections in the parietal, frontal and temporal regions, and these kinds of dysfunctions raise the disease progression. Neurons and nerve cells can receive and send an electrical message to the body. In this case "*control voluntary*

*muscles*” assist the neurons to send and receive the electronic message. Sometimes neurons die and become unhealthy, at that time the connection can break down between muscles and the nervous system. It can be called atrophy or waste away or muscles weaken. Apart from this neuromuscular disease affects all the essential nerves that are controlled by the voluntary muscles and some essential nerves that are able to communicate sensory information to the brain [ 2]. Some muscular diseases can start from infancy or childhood. All symptoms depend on the type of neuromuscular disorder and also affect the body. Some major symptoms of the neuromuscular disease are, loss of muscles, problems in movement, problems in balancing, painful sensation, double vision, droopy eyelids, and breathing trouble. There are different types of neuromuscular diseases such as ALS, Myopathy, Myositis, spinal muscular atrophy, muscular dystrophy, multiple sclerosis, and many more. Viral infection, genetic mutations, autoimmune disorders, dietary deficiencies, metabolic disorders, drugs, and poison can cause neuromuscular disorders, and these diseases can have enough to hamper to destroy the well-being and quality of life. It can be stated that neuromuscular disease is one of the heterogeneous groups of disorders that are acquired or inherited. It can be responsible for abnormality in motor cells, neuromuscular junctions, peripheral nerves, and muscles [ 3 ]. This disease can change the control of the body and also affects all body functions also. On the other hand, this disorder becomes a big barrier for an individual and it also reduces the confidence of the individual. One of the major issues in this disease is, it can be a threat of postural control in the neuromuscular disorder and the other is inactivity due to ambulation loss. In both case, spinal stabilization can be also be affected due to postural and motor reason

### Effects of Neuromuscular Diseases

Junction of neuromuscular, skeletal muscles are affected due to NMDs. The effects of NMD are considered as progressive damages on the human body as the effects due to damages are risen and it decreases the ability of human body parts. Strength of muscles is reduced and as a result the patient loses physical ability for doing work [4]. Quality of human health has become poor for the affected people. Health of the skeletal is affected and for this reason bio-humoral issues are rising in the human body. Possibility of bone fracture and fragility rises due to issues of bio-humoral and affected health of the skeletal is responsible for these issues. In many cases, it is found that people suffering from NMD are affected by nutrition. Multiple effects are found among the patients who suffer from nutritional issues.

Tooth decay, high cholesterol, high blood pressure, stroke and heart disease and type 2 diabetes, these diseases rise on the human body due to nutritional issues. Capacity of work is badly damaged due to the effects of nutritional issues and the patient loses the flow of healthy life. Feeding disorders and problems of swallowing are also found in the people who are

affected by NMD. Eating disorder is considered to have moderate effects on human health [5]. Proper feeding is for developing bone and swallowing problems and feeding disorder reduces quality of feeding and for this reason there is found lack of food ingredients that are necessary for the growth of bone. On the other hand, the physical ability of humans depends on the development of bone. Swallowing problems and poor feeding affects the overall development of human bone and for this reason the physical ability of humans is damaged.

Low level physical ability of the patient is responsible for being overweight that affects bone health. In NMD cases, deficiency of vitamin D has been found that affects growth of bone. In various stages, peripheral nerve system disease is also responsible for bone weakness. Involvement of protein and its structure are responsible for occurring peripheral nerve system disease that is rated to human bone. Bone weakness problem is increasing due to involvement of NMD in the peripheral nerve system. Less time left for the NMD affected patient for involvement in physical activities [6]. This issue of rising possibility of falls and difficulty in walking is found. In the case of adult patients, the possibility of fracture is increased due to issues of weak bone that happens for NMD. Damage of secondary and primary bone is not considered as much as fatal effects as compared to muscle weakness.

Involvement of NMD in the junction of neuromuscular cells is responsible for occurring issues of damages of primary bone. These damages are associated with GC for MG patients. On the other hand, deficiency of vitamin D is also found among the patients who are affected by NMD and this deficiency helps to increase the level of serum in the human body. Two types of bone damages are found for adult patients one is congenital and other is neonatal and these two types of bone damages occur during the period of embryonic and postnatal. Hearing loss is the effect of CMV [7] Congenital NM is a vital health issue of childhood and ChAT is happened due to this disorder in childhood. Structures of the skeleton are affected due to NMDs and this effect happens in the early stage of this disease.

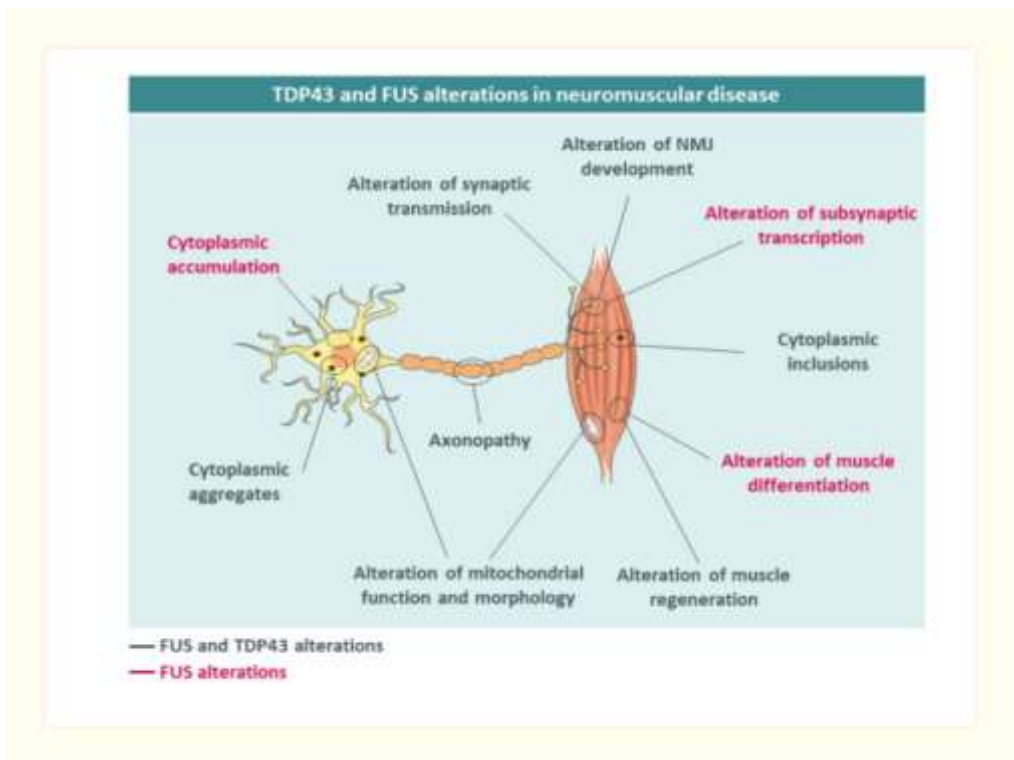
### Role of RNA Protein in Neuromuscular Diseases

Several diseases such as ALS, SMA are directly related with proteins which are built by RNA. RBPs, TDP-43, MATR3 and FUS are the RNA based proteins which have a huge impact on NMDs. RNA based protein is approached as a significant player in several biological processes [8]. Control over muscles is directly affected by NMD and fir this effect overall structures of muscles is changed. However, the neuron also has an important role to control movement of muscles and after damaging muscles, effects on muscles increases and this progress movement helps to lose capabilities of muscles, and as a result the patient goes towards paralyzed. RBP is associated with NMD that displays the structure of modular through well identification of subdomain. Limited sets of proteins have been done

through RBP that are related to RNA.

TDP43 is one of the important proteins which is able to bind RNA and DNA. In most cases it is found that TDP43 has a major contribution in NMD, around in 95% cases of ALS it is identified that this protein has a major role in increasing the issue of NMD [9]. Still, the way this protein is linked with FTD and ALS is unclear. This protein loses its function that affects function of the motor neuron. Survival of motor neurons is affected by this protein and as a result movement

of human body parts is also affected. On the other hand, TDP43 plays a critical role in the function of skeletal muscles. In occurring muscle disease, this protein had direct involvement. RNA is included in this protein and its presence helps to regenerate muscles. In many cases, regeneration of muscles is responsible for occurring muscle disease and for this reason TDP43 has a critical role in this disease. In various activities of muscles, this protein has direct involvement.



**Figure 1.** TDP43 and FUS

(Source: [9])

Neuromuscular junction operates most movement of human body parts and TDP43 participates in the formation of this junction. ALS, inclusion of body and muscles dystrophy are observed due to TDP43. FUS is also from the family of RBP and TAF15 and EWS are included in this protein. The FUS group has three pathological diagnoses [10]. These proteins are present in nucleus and control formation of RNA and DNA. In many researches it is found that stability of RNA and maturation are controlled by FUS in many cells such as muscle cells. ALS promotes damage progress in muscle cells and as a result, capability of muscles is decreased. Multiple NMD diseases happen due to involvement of FUS in the human body. Huntington and myasthenia are the NMD diseases for which FUS is responsible. In myasthenia, a muscle weakness issue is identified that reduces the physical ability of humans. EWS is one of the proteins from the family of RBP.

In cell differentiation, ESW participates effectively. In much research it is found that EWS and FUS make collaboration that is found among ALS patients. EWS1 is a

part of this protein and this protein involves reducing DNA and also decreasing density of mitochondria. TAF15 comes from the family of PET and the structure of this protein is similar to EWS and FUS. TAF15 protein is present in RNA and plays a role for metabolism [11]. This protein reduces mitofusin protein. In recent research, it is noticed that both MATR, TDP43 are involved in the occurring ALS. MATR3 has huge contributions to lead neuromuscular disease and this disease is involved in muscle weakness which occurs due to neuron disease. Many other hnRNP is associated with NMD disease.

### METHODOLOGY

Research methodology is considered as a process or procedure by which various steps that are followed during research are described. Research design, approach, philosophy, data analysis and data collection method are discussed as per the requirements in research [12]. Justification for using these research elements is also provided in the chapter of research methodology. Research

philosophy is a wide topic and in this topic assumptions, knowledge about the research are discussed. Different kinds of researchers have different kinds of assumptions about research and this topic in research methodology is used to understand the importance of individual assumptions from the point of view of research. Positivism, pragmatism and interpretivism, these three research philosophies are present to understand assumptions of different researchers. Positivism research philosophy has been used in this research.

This philosophy is highly structured and for this reason researchers have the opportunity to understand the research related assumptions and knowledge easily. However, large sample size can be determined through this research philosophy and large size samples help to find better research outcomes that increase effectiveness of research. Interpretivism research philosophy is able to determine small sizes that cannot define better research outcomes [13]. Considering the facts, positivism research Philosophy has been used in this research to understand different kinds of research related knowledge and assumptions. Research approach is considered as a method that is used to choose the required data collection method. Deductive, abductive and inductive are the research approaches. Researchers use deductive research approaches to find out true conclusions from discussion and most of the researchers consider this approach for this purpose.

Data is collected under this approach to test research hypotheses and in this research hypothesis has not been used and for this reason deductive research approach has not been chosen in this study. Researchers consider inductive research approaches to explore research phenomena that help to provide research outcomes [14]. Considering the fact, an inductive research approach has been chosen in this study. Research design is about the strategy which is used to collect data for answering research questions. In qualitative research four types of research designs such as case study, grounded theory, phenomenology and ethnography are included in the chapter of research methodology. Under the case study, different kinds of data can be collected from various sources and as a result researchers have the opportunity to make wise discussions over the research topic.

Considering these benefits, case study research design has been approached for this proposed study.

Large amounts of data are available to understand secondary qualitative data collection and for this reason researchers have the chance to consider various data as per the requirements of research. Online articles, journals, websites and magazines are the sources of secondary qualitative data and most of these data sources are easily available in google and google scholar [15]. This easy accessibility helps researchers to collect from the data sources. On the other hand, less efforts are required to collect secondary qualitative data from the sources that reduces time consumption in research. Huge time consumption increases the budget of research and less time consumption in data

collection helps to decrease budget and researchers get economic support due to secondary qualitative data collection. Secondary data are used in many previous research and for this reason the effectiveness of this data is proven. However, no human participants are needed to collect data.

Involvement of human participants increases the overall budget of research and in secondary qualitative data collection human participants are not required. It helps researchers to conduct the entire research within a limited budget. Consumption of less time also helps to complete the entire research within the proposed time that manages acceptance of study [16]. Considering these benefits, a secondary qualitative data collection method has been chosen for this study. Online articles and journals have been used for this study to collect data as per the requirements. Various journals related to neuromuscular disease have been chosen as the source of secondary qualitative data. Online articles and journals associated with function of muscles and impact of nerve and muscles problem on it have been approached to collect topic oriented data. Discussion has been developed based on the collected data from these sources. This wise discussion helps to make effective research outcomes. Google and google scholar have been used to collect data from the chosen online article and journals.

## DISCUSSION

In recent research neuromuscular junction has approached as a key factor of in traction. Various essential communication links are present between muscles and nerves and this communication helps to operate movement of different parts of the human body [17]. Changes in age skeletal happens by advancing age. These changes parallelly facilitate the implementation of therapeutic strategies. Increasing levels of NMJ measure the changes in age skeletal. Physical activities are controlled by age skeletal and effects nerve and muscles play important roles to bring changes on it. This situation decreases the capability of skeletal age and as a result, the ability for physical activity of the human body is decreased. However, the ability to operate movement of human body parts is reduced due to age and for this reason humans need to be involved in regular activities to improve the ability of NMJ.

Loss of function in muscles is increasing for various reasons such as age based changes and biological changes and neuromuscular disease. Movement of patients becomes slow and for this reason movement of NMJ is occurring properly. This improper movement makes muscles weak and slowly the entire structure of the skeletal muscles is changed. NMD plays a big role in changing the structure of skeletal muscles that makes muscles weak. Skeletal muscles have about 40% of contribution in the human body [18]. This situation of the human body decreases the ability of doing physical activities and patients cannot move easily for their daily activities. Multiple function disorders and body structure are noticed due to NMD in the human body. Loss of



strength, balancing problem, atrophy, myotonia, pain, COPD and contracture. Progress in loss of strength is the leading problem of NMD and most of the patients who are affected by this disease suffer from this problem.

Deficiencies in function are noticed among the NMD affected patients and weakness of muscles is the main reason for occurring this problem in the human body. NMD is responsible for making muscles weak and in most of the cases, losing strength problems are found in the mimic and neck muscles [19]. Progress of losing strength of muscles depends on the nature of the NMD disease and for this reason various NMD affected patients have different progress in losing strength in muscles. Intrinsic fiber is present in muscle tissue and reduction of this fiber is the main reason for losing strength in muscles. NMD decreases the size of intrinsic fibers and for this reason the strength of muscles is decreased. However, fat infiltration replaces the fibers and this disturbance is the main cause of nerve stimulation.

This condition reduces the optimal length muscles and for this reason the ability of muscles in physical activity is decreased. In research it is found that around 75% NMD patients suffer from losing muscle strength [17]. It is found that NMD affects few particular muscles and incidents of losing strength occur with the particular muscles. Humerus, mimic muscles, facial and scapula are the specific muscles which are affected by NMD and lose their strength. Strength is vital for movement of transferring extremities from lower to upper extremity and postural control manages this strength. In most cases it is found that many muscle patients lose their ability to walk due to muscle problems. In lateral balance, hip movement has an important role and weakness of proximal muscles disrupts the capability of balancing while external shocks. Weakness of distal muscles plays a leading role for falling in different ways. NMD is responsible for reducing the strength of muscles and as a result these kinds of issues are faced by patients. Recent study shows that chronic pain, the common symptoms of NMD, affected patients.

Movement of the chronic pain is progressive and for this reason muscles weakness, ligament laxity and fatigue issues are risen due to this disease. Large number of people are affected by NMD. In the UK, around 150,000 people are affected due to neuromuscular disease and all over the world about 14000000 people are the victims of this disease [20]. These people are suffering from several health issues such as muscle weakness. Motor nerves are badly affected by the NMD suffered people and multiple issues of the spinal cord are found among these patients. Genetic and acquired diseases are the reason for this disease in humans. During treatment both kinds of patients are found and the affected nervous system is the trigger of the patients. Age is not variance for those affected by this disease. From birth to older age people are affected by this disease and mostly patients suffer from issues of weak muscle. The muscles which are affected by this disease become senseless and for this reason patients cannot provide responses properly by the muscle that

increases the possibility of paralyzed. Motor neurons are affected by NMD and for this reason transfer of electronic signals in humans is affected. This effect plays an important role not to send the required response to the particular muscle. This situation is responsible for not doing any movement of humans by the muscle. In many cases, the process of visual information in the human brain is affected due to NMD.

## CONCLUSION

The above study describes the neuromuscular disease that makes a huge negative impact on individual life. And it has been seen that those individuals who are suffering from these dangerous diseases, lose their ability to do everyday activities. The neuromuscular disease generally happens from a genetic disorder, outer viral infection, or metabolic disorder. Sometimes it affects the nervous system that is more essential for the body and affects the body's immunity system. Reducing immunity is responsible to increase other kinds of health issues and it creates a barrier to the body's growth, and development. This study has highlighted the actual concept of neuromuscular disease that directly affects the all-over muscular function. From this research paper, it has been seen that spontaneous gene mutation and serious types of immune systems disorder can be responsible for increasing the symptoms. Muscle weakness is the primary symptom of this disease, and this kind of disease is not curable. Better treatment can be able to reduce the symptoms and also control the situation. Moreover, this paper also discussed the effects of neuromuscular disease that generally happens due to NMDs. In this context, it can be said that these factors decrease the abilities of the human body and some external and internal body organs. RNA protein also plays a significant role in neuromuscular disease and this study has shed light on the RBPs, TDP-43, MATR3 and FUS are the RNA based on proteins that have a huge impact on NMDs. In order to control the disease practitioners have taken the innovative initiative to decrease the disease rate.

## REFERENCE

- [1] Picchiarrelli, G. and Dupuis, L., 2020. Role of RNA Binding Proteins with prion-like domains in muscle and neuromuscular diseases. *Cell Stress*, 4(4), p.76.
- [2] Mary, P., Servais, L. and Vialle, R., 2018. Neuromuscular diseases: Diagnosis and management. *Orthopaedics & Traumatology: Surgery & Research*, 104(1), pp.S89-S95.
- [3] Lepore, E., Casola, I., Dobrowolny, G. and Musarò, A., 2019. Neuromuscular junction as an entity of nerve-muscle communication. *Cells*, 8(8), p.906.
- [4] Iolascon, G., Paoletta, M., Liguori, S., Curci, C. and Moretti, A., 2019. Neuromuscular diseases and bone. *Frontiers in Endocrinology*, 10, p.794.
- [5] Rodgers, E., Marwaha, S. and Humpston, C., 2022. Co-occurring psychotic and eating disorders in England: findings from the 2014 Adult Psychiatric Morbidity Survey. *Journal of Eating Disorders*, 10(1), pp.1-10.
- [6] Carraro, U., Marcante, A., Ravara, B., Albertin, G.,

- Maccarone, M.C., Piccione, F., Kern, H. and Masiero, S., 2021. Skeletal muscle weakness in older adults home-restricted due to COVID-19 pandemic: a role for full-body in-bed gym and functional electrical stimulation. *Aging Clinical and Experimental Research*, 33(7), pp.2053-2059.
- [7] Tsuprun, V., Keskin, N., Schleiss, M.R., Schachern, P. and Cureoglu, S., 2019. Cytomegalovirus-induced pathology in human temporal bones with congenital and acquired infection. *American journal of otolaryngology*, 40(6), p.102270.
- [8] Sanya, D.R.A., Cava, C. and Onésime, D., 2022. Roles of RNA-binding proteins in neurological disorders, COVID-19, and cancer. *Human Cell*, pp.1-22.
- [9] Picchiarelli, G. and Dupuis, L., 2020. Role of RNA Binding Proteins with prion-like domains in muscle and neuromuscular diseases. *Cell Stress*, 4(4), p.76.
- [10] Gittings, L.M., Foti, S.C., Benson, B.C., Gami-Patel, P., Isaacs, A.M. and Lashley, T., 2019. Heterogeneous nuclear ribonucleoproteins R and Q accumulate in pathological inclusions in FTLD-FUS. *Acta Neuropathologica Communications*, 7(1), pp.1-13.
- [11] Sellami, L., Saracino, D. and Le Ber, I., 2020. Genetic forms of frontotemporal lobar degeneration: current diagnostic approach and new directions in therapeutic strategies. *Revue Neurologique*, 176(7-8), pp.571-581.
- [12] HR, G. and Aithal, P.S., 2022. How to Choose an Appropriate Research Data Collection Method and Method Choice among Various Research Data Collection Methods and Method Choices During Ph. D. Program in India?. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, 7(2), pp.455-489.
- [13] HR, G. and Aithal, P.S., 2022. Why is it Called Doctor of Philosophy and Why Choosing Appropriate Research Philosophical Paradigm is Indispensable During Ph. D. Program in India?. *International Journal of Philosophy and Languages (IJPL)*, 1(1), pp.42-58.
- [14] Al-Ababneh, M.M., 2020. Linking ontology, epistemology and research methodology. *Science & Philosophy*, 8(1), pp.75-91.
- [15] Sutton, A., Clowes, M., Preston, L. and Booth, A., 2019. Meeting the review family: exploring review types and associated information retrieval requirements. *Health Information & Libraries Journal*, 36(3), pp.202-222.
- [16] Chen, J. and Ran, X., 2019. Deep learning with edge computing: A review. *Proceedings of the IEEE*, 107(8), pp.1655-1674.
- [17] Pratt, J., De Vito, G., Narici, M. and Boreham, C., 2021. Neuromuscular junction aging: a role for biomarkers and exercise. *The Journals of Gerontology: Series A*, 76(4), pp.576-585.
- [18] Chen, W.J., Lin, I., Lee, C.W., Yoshioka, K., Ono, Y., Yan, Y.T., Yen, Y. and Chen, Y.F., 2022. Ribonucleotide reductase M2B in the myofibers modulates stem cell fate in skeletal muscle. *NPJ Regenerative medicine*, 7(1), pp.1-12.
- [19] Sandoval-Munoz, C.P. and Haidar, Z.S., 2021. Neuro-Muscular Dentistry: the “diamond” concept of electro-stimulation potential for stomato-gnathic and oro-dental conditions. *Head & Face Medicine*, 17(1), pp.1-16.
- [20] Intechopen.com, 2022. Neuromuscular Diseases and Rehabilitation. Available at: <https://www.intechopen.com/chapters/54500> [Accessed on 20th december, 2022]