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Association Between Grip Strength and Quality of Life as Specific Domain of Elderly: A Review

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KEYWORDS

Quality of life, hand grip strength, Elderly, WHOQOL-OLD, ADLs or ADL, Jebsen hand function test, functional dependency, cognitive status

ABSTRACT:

Measures of grip strength have emerged as clinically viable for determining the risk for functional disability, early mortality, morbidity, and aided in identifying cognitive deficits. However, the phenomenon that links grip strength with quality of life remains unclear and remains limited. The aim of this review is to examine the factors associated with a decline in grip strength and its correlation with functional dependency, mobility, and cognitive status affecting the quality of life. The effect of this narrative review is to check the prevalence of decline in grip strength with age and how it can effect the quality of life in elderly. A total of 60 studies were retrieved from 120 citations. The study concluded that most of the studies have shown a decline in the grip strength of both dominant and non-dominant factors of both males and females. Studies also revealed that the changes in the skeletal system led to changes in the hand grip as there was a change in ligaments and muscles in the elderly. Finally, it concluded that functional and cognitive dependency was decreased due to low grip strength, which may contribute to a decline in the quality of life in the elderly.

1. INTRODUCTION

• ***Grip strength*** is a measure of muscular strength or maximum force or tension generated by one's forearm muscles. Grip strength is used in different scenarios to evauate many health related conditions. The World Health Organization (WHO) estimated that the proportion of the world's population aged over 60 years will double from 12% to 22% between 2015 and 2050. The health status, community service, and quality of life will be needed to determine the gender of the elderly population, which will aid in strengthening the policy base for the elderly population and developing the Quality Of Life (QOL) [1]. For an elderly population, poor muscle strength is considered one of the most important public health issues, which may lead to numerous negative outcomes, such as limited daily living activities, falls resulting in injuries, and quality of life. The quality of life can be defined by the presence of autonomy, pleasure, self-realization, and the presence of control, therefore, these factors possibly cause damage to the dimensions that interfere with the quality of life of elderly people. The grip strength is a common measure of muscle strength, which is sensitive to age-related changes and changes in biological functioning. It is measured repeatedly in both hands using a handgrip dynamometer [2, 3, 4]. For the elderly population, handgrip strength is strongly correlated with total muscle strength, which is often used as an indicator of the overall muscle strength of elderly people [5, 6]. As such, hand grip strength measurement may help to detect quality of life. Thus, to improve the quality of life for people, various levels of measurement, such as Activities of Daily Living (ADL), the WHO Quality Of Life of Older Adults scale (WHOQOL-OLD), the Jebsen hand function test, etc., have been used for measurements [7, 8]. Other reviews also suggested the correlation of hospital discharge and stronger hand grip. Geriatric depression scale and hand grip measurements were corelated . Person with a bad score and low grip strength hand a late discharge. Hand grip measurements and functional assesstment were also compared between inhabitants among community dwellers and geriatric nursing residents which significantly concluded that nursing residents patients had a lower hand grip strngth Based on the existing research, hand

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grip strength is presently used as a predictor of complications, disability, and prolonged hospitalization. Thus, based on previous studies, hand grip strength has been associated with muscle mass, which correlates with deterioration in elderly quality of life. Notably, the inconsistency in evidence is reported in existing research, which has highly focused on the relationship between grip strength and the mental and physical health aspects of quality of life [9, 10]. Only limited research has identified the associations between grip strength and quality of life of functional dependency and cognitive status of life. In addition, the relationship between grip strength and quality of life, especially for the elderly, needs to be understood better. The increasing number of elderly people and a decrease in quality of life in elderly patients demonstrate the need to study the correlation between grip strength and quality of life. Therefore, this paper reviewed the restoration of grip strength to enhance the quality of life of the elderly. The objective of this study is to explore the factors responsible for the decline in grip strength and its correlation with functional dependency, mobility, and cognitive status affecting the quality of life. The structure of this paper is organized in a sketched diagrammatic format, which is shown in below Figure 1,

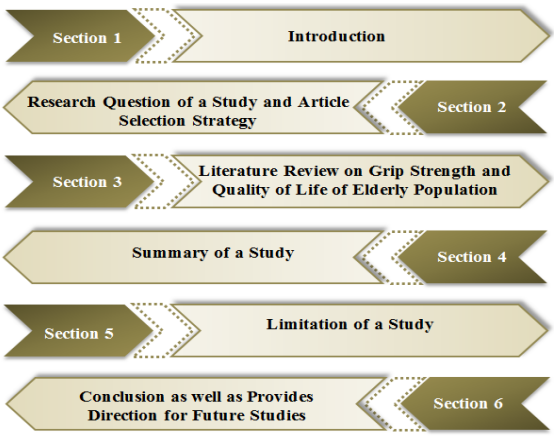

Figure 1: A deposition of the study

2. RESEARCH QUESTIONS AND SELECTION STRATEGY OF THE ARTICLE

This survey aims to understand the grip strength measure of the elderly population for the quality of life. For conducting an effective review of a topic, it is necessary to formulate the research questions, and this paper is strategically organized to answer the research questions of a study.

2.1. Research questions

The research questions formulated for the current review were as follows:

✓ What is the relationship between health-related quality of life and handgrip strength among elderly people?

✓ What are the factors responsible for the decline in grip strength?

✓ How do functional dependency, mobility, and cognitive status affect the quality of life?

✓ How does the grip strength affect the emotional, physical, and functional status of the elderly person's decline in overall quality of life?

2.2. Search strategy

✓ A systematic and well-planned search is essential for gathering applicable material from the searched data of the desired domain. To describe the subject and field of study in the titles and abstracts of research articles, keywords are considered as significant words. Thus, to obtain solutions to the study questions, literature is searched by using related keywords. Further, by using keywords, literature is retrieved from the database and other sources. Thus, to discover the primary studies for review, there is a list of the keywords that have been used in the “Abstract” section. By using the provided keywords, the research process is made more accessible. For the selection strategy of an article, a Prisma model has been applied, which depicts the flow of information through the different phases of a review. It maps out the number of retrieved papers and the included and excluded data. The framework of Prisma is shown in Figure 2,

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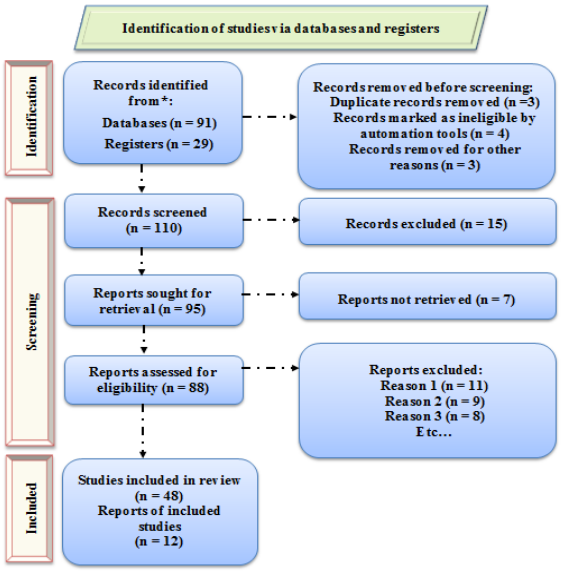

Figure 2: Prisma Framework for search strategy of article

2.2.1. Resources and Evaluation Procedure

This section outlines the resources used for our literature search and the evaluation procedure.

Resources: This study conducted an initial research inquiry on well-reputed academic search engines, including IEEE Xplore, Springer, Elsevier, as well as Google Scholar, to extract information relevant to entrepreneurial marketing. Our primary search focused on research materials related to the underlying topic within the time frame from 2013 to 2023.

Database Selection: The paper was identified and selected based on titles considered relevant to our study from authoritative databases, such as Scopus, Science Citation Index Expanded (SCIE), and Web of Science (WOS), among others. These databases were chosen for their academic reliability and comprehensive coverage of journal articles within various academic disciplines.

Database Insights: Scopus, for instance, stands out as the largest abstract and citation database of peer-reviewed literature, encompassing scientific journals, books, and conference proceedings. Each of the selected databases offers unique advantages in terms of content and presentation of research.

Paper Selection: Following a meticulous analysis of journals associated with our primary keywords, a total of 80 papers were selected for this systematic review. These papers were chosen based on predefined criteria that deemed them most suitable for our study. A graphical representation of the search results of this review is presented in Figure 3,

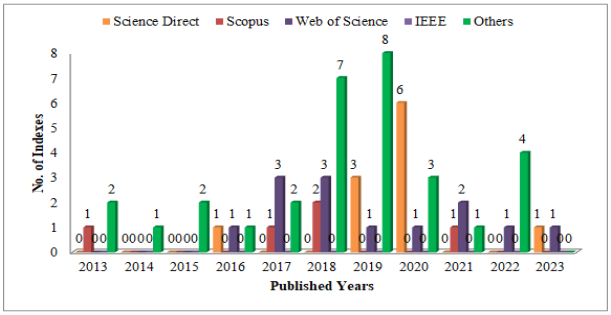

Figure 3: Search results of the article

2.2.2. Inclusion and Exclusion Selection Criteria

Based on certain specified parameters, such as the language of the paper, the year of the paper, and the relevance of the topic within the desired domain, the initial selection was considered.

❖ Initially, an extensive list of papers is included following the keyword search.

❖ Research papers written only in English language were included, whereas other language papers were omitted.

❖ This review paper focused on research published between 2013 and 2023.

❖ Papers from renowned publishers are included, such as IEEE, Springer, Wiley, etc.

❖ Then, the abstracts of the papers are read, and those papers are included, which describe the presented domain of the paper.

❖ Papers that were not focused on the domain of grip strength of elderly people were omitted.

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❖ Articles are included if the solution to any question is found; otherwise, it is excluded.

❖ 3. LITERATURE SURVEY

❖ Over the years, the elderly population has been increasing at a steady pace. Aging is inevitable and therefore, it is imperative that the physical limitations of the elderly population are considered. There have been numerous studies carried out to explore the grip strength among various kinds of populations. This section indicates the health-related quality of life and grip strength. This section indicates the grip strength and quality of life of the elderly population. Section 3.1 defines the relationship between health-related quality of life and handgrip strength among elderly people; section 3.2 explains the factor responsible for the decline in grip strength, section 3.3 investigates the functional dependency, mobility, and cognitive status affecting the quality of life; section 3.4 analyzes how the grip strength can affect the emotional, physical, and functional status of the elder person.

3.1. Relationship between grip strength and quality of life of the elderly population

As aging processes, the major health problems are considered to be grip strength impairment in cognitive function and its intensified form and dementia, which in turn cause economic burden to the national social welfare and public health. It threatens the quality of life of older adults and families and poses significant challenges to aging societies. All over the world, there is an increasing recognition of the serious health consequences of grip strength by causing poor quality of life in terms of morbidity, disability, mortality, and significant healthcare costs. To measure the grip strength in the elderly, hand grip strength measurements are simple and inexpensive, and are widely used for the elderly population. It is used in elderly adults as a screening index for sarcopenia. Moreover, poor hand grip strength is associated with disability and mortality in older adults and it has been found to be a useful index for frailty [11, 12, and 13].

Kimi Estela Kobayashi-Cuya*et al.* [14] intended to analyze hand dexterity and handgrip strength with executive function in mentally and physically healthy community-dwelling older adults. A total of 326 older adults have been considered for the analysis. By applying a hand dynamometer and the Purdue pegboard test, a hand dexterity and handgrip test has been conducted. Furthermore, with the use of a Mini-Mental State Examination (MMSE), the cognition has been assessed. Findings proved that there was no significant association observed between the handgrip strength and executive function variables. However, the use of the Purdue Pegboard test was vulnerable to the effects of aging.

Hui Lin Ong *et al.* [15] demonstrated the values of handgrip strength among older adults and investigated the sociodemographic and anthropometric correlates of handgrip strength. Study data has been collected from 2043 older adults in Singapore. The handgrip strength was obtained by using a Jamar plus and digital hand dynamometer. Compared to other Asian and Western countries, the handgrip strength among Singapore's older adults was relatively low and HGS also decreased with increased age across all sexes and ages. However, there was a possibility that the selected participants were older adults; they might not understand the instructions during the measurement of handgrip strength.

Therefore, the comprehensive details of the relationship between grip strength and the quality of life of the elderly population and the measurement used for grip strength are shown in below Table 1.

Table 1: Analysis of the relationship between grip health-related quality of life and grip strength

Author	Aim	Test measurement	Relationship score	Limitations
Alice Laudisio*et al.* [17]	Investigate the associations between health-related quality	Hand grip dynamometry.	Physical composite score (PCS): (OR=1.05; 95%	Due to the cross-sectional design, this study does not allow to establish any

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	of life and hand grip strength among the oldest people.		CI=1.01-1.10, P=.042), Mental composite score (MCS): (OR=1.05; 95% CI=1.01-1.10, P=.036)	cause effect between quality of life and hand grip strength.
HadeelHalaweh [18]	Aim to identify the correlation between quality of life and HGS among community-dwelling older adults	Jamar Dynamometer	HGS and QOL were negatively correlated with age (p < .001)	The study does not enable a true causal association due to cross-sectional design.
Se-Woong Chun *et al.* [19]	Explore grip strength and its relationship with QOL and metabolic syndrome in the elderly	Digital grip dynamometer	QoL: Men 2.006 (1.314–3.062), Women 1.612 (1.033–2.515) Metabolic syndrome: Men 4.194 (2.985–5.892), Women 1.845 (1.283–2.655)	The whole-body muscle mass or physical performance was not represented in the adopted grip strength.
Shanshan Yang *et al.* [20]	Explore the relationship between QoL and muscle strength in a Chinese elderly population	Jamar hand dynamometer	EQ-5D index (β=0.015 per SD, 95%CI: 0.008 to 0.023, p<0.001)	Due to limited participants, more objective investigation tools cannot be used.
JeongkiPaek and Yoon Ji Choi [21]	Aim to examine the association between QoL and HGS	Digital hand dynamometer	OR:0.86 to 0.97 in self-care, mobility, usual activity, and pain/discomfort	Difficult to assess causality between HGS and quality of life due to cross-sectional design
Seo Young Kang *et al.* [22]	Determine the relationship between low HGS and QoL in Korean men and women	Digital hand dynamometer	Men: (OR 1.93, CI 1.25–2.98) Women: (OR 2.12, CI 1.02–2.87	However, the proportions of nonsmokers and non-drinkers were higher in the low HGS.
YeunheeKwak and Yoonjung Kim [23]	Analyze the subjective health status ofQoLand handgrip strength in the elderly	Digital Grip Strength Dynamometer	Low HGS: (OR 1.30 and CI: 1.00-1.69)	The study was limited to the elderly Korean population, whereas the same result was not generalizable to other geographical regions or countries.
A Wiraguna and S Setiati [24]	Examine the correlation of QoL and HGS in elderly patients	Jamar dynamometer	Significant score (r = 0.219; p = 0.015	Limited sample size
Helena Horder*et*	Aim to demonstrate	Jamar	Physical function: 1.7	However, the physical

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al. [25]	the QoL in relation to walking habits and fitness status in older persons	dynamometer	(0.8-3.7)	activity level was measured with a global question, which lacked information about intensity.

3.2. Factor responsible for the decline in grip strength among older adults

Worldwide, population aging is accompanied by the incidence of physical limitations, which degrades the quality of life and enhances health care costs. The characterization of grip strength is significant because the loss of strength is central to a number of major geriatric syndromes, including frailty, sarcopenia, falls, and mobility. Several factors were strongly associated with the decline in grip strength [26, 27].

Christina Musalek and Sylvia Kirchengast [28] investigated the physical well-being impact assessed by hand grip strength of QoL among old age people. Based on the WHOQOL-BREF questionnaires, a sample was collected from 63 old age people. The grip strength measurement was examined through a hand-held calibrated dynamometer. The study concluded that no significant association has been found between intergenerational contacts as well as the number of offspring and health-related quality of life. However, the main outcomes of the participants in this study were very low.

Po-Jung Pan *et al.* [29] aimed to explore the factor associated with hand grip strength among elderly individuals. In this study, a total of 2470 older adults have been randomly selected from YilanCity, Taiwan. With a hydraulic hand dynamometer, the HGS of both hands of older adults has been analyzed. The study revealed that compared to women, the HGS was higher in men. Moreover, the physical and mental components' measures of quality of life were positively associated with HGS. A limitation of this study was that some factors related to muscle strength, such as nutritional status, were not included.

Ola Sternang*et al.* [30] demonstrated the factors associated with grip strength decline in older adults. By using a methodology of longitudinal Swedish Adoption/Twin study of aging (SATSA), data has been collected from 849 participants. By using latent growth modeling, a study of longitudinal analyses has been examined. Findings indicated that the factors of age slopes, stress, smoking, dementia, mean arterial pressure, and physical activity at work were associated with grip strength across the lifespan of adults. However, there might be a potential impact of sample attrition on the results.

The factors associated with the decline in grip strength have been essentially needed to identify the elderly population. Thus, the factors in grip strength and its confidence interval significance value, and the study's aim and limitations have been presented in below Table

Table 2: Analysis of factors associated with the decline in grip strength

Author	Aim	Factors	95% CI or SE	P-value	Limitations
Mingchao Zhou [31]	Investigate the factors affecting the handgrip strength-related outcome among people	Body composition, physical fitness, and CRF	CI = Male 0.032 – 0:398, female 0.026-0.321	$p < 0.05$	The participants included in this study had cardiac arrest, congenital heart disease, and muscular disorder; therefore, this study couldn't be generalized to other people with these conditions.
Diana Kuh*et*	Identify the	Birth weight,	CI=0.02 to	p=0.003	Low sample size.

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al. [32]	developmental factors associated with the decline in grip strength from old age people	growth parameters, motor, and cognitive development	0.1		
Marianne Huebner *et al.* [33]	Examine the age-associated rate of decline in grip strength in engaging in physical activity	Sex-specific factors	CI: 50, 60 among older adults	$p < 0.05$	The use of a simple assessment of muscle strength limits the overall strength.
Hao Liu *et al.* [34]	To identify the influencing factors of weak grip strength	Older age, depression	CI: Female 1.243–1.523	P<0.001	Only samples collected from females are responsible, however, the result might be different from males.
Francisco Jose Amo-Setien*et al.* [35]	Determine the factors associated with grip strength	Age, sex, height, weight, handedness, nutritional status, and academic performance	CI: Men 1.3-6.5 Women 1.0-7.5	P < .001	However, the study does not include the pubertal stage for better understanding.

3.3. Functional dependency, mobility, and cognitive status affecting quality of life

The grip strength plays a crucial role in the daily lives of people and serves as the individuals' reliable proxy indicator. Grip strength is a reliable common health indicator, particularly for the elderly group of the population, and hand grip strength is an easy-to-measure indicator of muscle function, mobility, and nutritional status among the population. Thus, functional dependency, mobility, and cognitive status play a crucial role in health and disease and it is influenced by age [36, 37, and 38].

Carmen Garcıa-Pena [39] aimed to investigate the functional decline of handgrip strength among hospitalized male elderly. A sample has been considered from 223 patients among older Mexicans by using a stratified sampling technique; a sample was collected and analyzed. Furthermore, to test the independent association between functional decline and handgrip strength, logistic regression was used. The result revealed that low HGS among males had an increased risk of functional decline at discharge (OR 0.88, 95% CI 0.79–0.98, p = 0.01). However, only male patients were considered, therefore, there is a limitation in selection criteria, which limits the generalizability of the findings.

VítorPinheira*et al.* [40] explored the relationship between the physical, mobility, and cognitive state and health status of the elderly population in Portugal. The sample was gathered from 118 individuals and analyzed through the descriptive methods. In this study, the measurement instruments used for the analysis of grip strength were MMSE, GDS, SF-12 TUG, HGS, and IPAQ. Findings proved that there was a negative correlation between MMSE and TUG. Moreover, the SF-12 represents a negative correlation with TUG, while left HGS had a positive correlation to SF12 in both mental and physical dimensions.

Jiranan Griffiths *et al.* [41] intended to analyze the relationship between TUG, HGS, and mild cognitive impairment in older people. Data was taken from 398 participants, and by applying multiple regression analysis, the relationship among selected variables was identified. Finally, the study of the result showed that the TUG ($\beta = -0.022$, $p = 0.013$), age ($\beta = -1.677$, $p = 0.019$), education level ($\beta = 2.801$, $p < 0.001$), TGDS ($\beta = -0.248$, $p = 0.011$), and GS ($\beta = 0.032$, $p < 0.001$) were associated with MCI. Due to the limitation of data,

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the study from one sub-district might not be generalizable to other settings.

Many existing papers used different measurements for identifying the functional dependency, mobility, and cognitive status affecting the quality of life. Here, the types of measurement outcome used, and the study's main aim and outcome along with disadvantages are shown in below Table 3.

Table 3: Analysis of functional, mobility, and cognitive status of QoL

Reference	**Aim**	**Study design**	**Outcome measurement**	**Main outcome**	**Disadvantages**
I K Pratama and S Setiati [42]	Investigate the correlation between functional mobility and HGS in elderly patients.	Cross-sectional study	TUGT	Moderate relation: P = 0.000. r = −0.568	However, the functional mobility measurement was only sufficient to measure HGS.
FulvioLauretani*et al.* [43]	Demonstrate the cognitive impairment, muscle weakness, and their interaction in elderly outpatients.	Observational study	MMSE	Negative relation: β: −0.02 ± 0.01; p=0.04	The study considered only outpatient respondents, whereas the same result was not applicable to other older patients.
JochananStessman*et al.* [44]	Analyze the HGS trajectory and its association with cognition, mortality, and function	Longitudinal and Cross-sectional Cohort Study	HGS	Poor functional measure from age 78 to 85: (2.68, 1.04–6.89) and 85 to 90 (2.31, 1.01–5.30)	However, there was a lack of standardized procedures for assessing HGS, which led to potential sources of bias and error.
SupaPengpid*et al.* [45]	Examine the HGS and its sociodemographic and health correlation among older adult men and women.	Cross-Sectional Design Study	Anthropometric and HGS	Negative relation: cognitive functioning:- 2.67 (-3.13 to -2.21) Functional disability: -2.19 (-2.53 to -1.86)	Due to the cross-sectional design, the study couldn't attribute any of the associated variables.
Sebastien Barbat-Artigas *et al.* [46]	Investigate the association between various	Cross-sectional Prospective Cohort Study	IADLs	Mobility function: 6.12 (4.23–8.86)	Compared with longitudinal studies, this

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	indexes of muscle mass and functional performance at risk of functional impairments				study overestimated the risks of having impairments due to cross-sectional design
Charlotte Buckley *et al.* [47]	Aimed to analyze the functional endurance, muscle strength, and health-related quality of life	Limited CrossSectional Study	GS	Moderate relation: QPT: (r=0.44), 1MSTS (r=0.36), and 2MSC (r=0.36)	Small sample size
Kristin Haraldstad*et al.* [48]	Identify the muscular strength associated with functional ability in the elderly with enhancement in QoL	Double-Blind Experimental Design	HRQoL	Positive relations: Physical function (p = 0.042	The improved HRQoL quality couldn't be ruled out due to the lack of a control group.
Mark D. Peterson *et al.* [49]	Explore the low normalized grip strength for cardiometabolic disease and physical disabilities among Chinese and U.S population	QuasiExperimental Design Study	GS with ADL	Every lower NGS (0.05) was independently associated with a 1.49	The repeated cross-sectional waves in NHANES posed challenges in causal inference.
Manuela Carolina Montes *et al.* [50]	To demonstrate the association between HGS and multimorbidities in older community-dwelling individuals in Brazil	Cross-sectional population-based study	GS	Positive relation: Men 1.15- 1.95 Women 1.03-1.32	However, this study does not attain the causal relationships between the investigated factors.

MMSE: Mini nutritional assessment short-form score

3.4. Emotional, physical, and functional status of the elder person

The individual undergoes various physical, emotional, and functional changes including changes in perceptions, social behavior, intimate relationships, and sexual maturation. These changes make the individuals a stressful period of life with discernable physical, emotional, behavioral, and functional changes. Grip strength is largely mediated by these emotional, physical, and functional statuses, and it also varies by sex, health, anthropometric, hormone, and socioeconomic variables [51, 52, and 53].

EvaldoRibeiroJr*et al.* [54] explained the emotional and functional status factors of aggression, testosterone, digit ratio (2D:4D), cortisol, and personality of HGS. Data was considered from 89 men. Moreover, by

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utilizing the multiple regressions with HGS, the result of a study was analyzed. The result revealed that the HGS negatively correlated with life hand 2D:4D, whereas in the control condition, HGS was not correlated with 2D:4D. Further, it indicated that physical aggression, BMI, and emotional stability were significantly related to HGS. However, the collected samples were very low in this study, and the study considered data only from male respondents, whereas female respondents were not included.

YoshibumiBunno and Chieko Onigata [55] explored the impact of emotion on isometric precision pinch grip with the comparison of pleasant and neutral emotions. A total of 32 healthy respondents were considered for the study. From the findings, the study showed that pleasant emotion led to a lower coefficient of variation of pinch grip force production than the neutral image conditions. The study concluded that the emotion of pleasantness enhances the force control of the isometric precision pinch grip. A limitation of this research was that the study does not assess the force steadiness of no-cute images or unpleasant images.

Therefore, the comprehensive details of the various physical, emotional, and functional statuses of the grip strength of the population are shown in Table 4.

Table 4: Analysis of physical, emotional, and functional status

Author	Focus	Physical	Emotional	Functional status	Relationship status	Disadvantage
Jolly Bhattacharjya*et al.* [56]	Explored the perceived stress impact on handgrip muscle strength among the healthy population	✓	-	-	Negative impact: (r = -.270*	The study does not measure the stress hormone levels
Adam J. Santanasto*et al.* [57]	Aim to identify the physical activity effect on grip strength, mobility, and physical function	✓	-	✓	Higher impact: Grip strength (p=0.62)	In this study, there were no direct measures of lower extremity muscle strength or fitness composition.
Bin Yu *et al.* [58]	Examine the physical and social isolation of risk factors for grip strength among older adults in China	✓	✓	-	Significant relation: Baseline loneliness Men (β = .01, p = .570) Women (β = .04, p = .035) Isolation Men (β = .05, p = .005)	However, with the use of one direct question, the loneliness factor has been assessed.

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					Women	
Cui Wang *et al.* [59]	Intended to identify the association between sleep duration and HGS among chronic obstructive pulmonary disease.	✓	-	-	Moderate relation: HGS (B = −7.830, 95%CI [−10.533, −5.127], p < .001).	Self-reports have been used for information relating to the various chronic conditions, which may indicate the possibility of biased results.
U. Ramnath*et al.* [60]	Investigate the relationship between physical, functional, and cognitive performance among older adults.	✓	-	✓	Cognitive Impairment: (-0.520, p < 0.01) Grip strength: (r = 0.42, p< 0.01)	The size of the sample was very low.

4. SUMMARY OF A STUDY

Among older persons, the loss of muscle strength may lead to various negative outcomes, such as limited daily life activities, and falls resulting in injuries and mortality. Therefore, low and poor muscle strength in the elderly is a significant public health issue. For muscle strength, grip strength is considered to be a common measure that is sensitive to age-related changes and changes in biological functioning. This paper provides a comprehensive review of the association between grip strength and quality of life in the elderly population. Moreover, this review expressed the factors that have been responsible for the decline in grip strength and its correlation with functional dependency, mobility, and cognitive status affecting an elderly person's quality of life. Based on this domain, a total of 4 research questions have been framed. Question 1 aims to provide a relationship between health-related quality of life and handgrip strength among elderly people, which has been reviewed and highlighted in Table 1. It showed that the relationship score has varied between gender, age, and syndrome. Further, these associations have been measured with Handgrip dynamometry, Jamar Dynamometer, Digital grip dynamometer, and Digital hand dynamometer. It showed that most of the trials were taken to measure the hand grips using a hand dynamometer [17, 19, and 21]. Next, research question 2 helps to know about the factors responsible for the decline in grip strength. Thus, this paper intends to review the associated factors and their reliable CI value, which is represented in Table 2. Therefore, the factors associated with the decline of grip strength are body composition, physical fitness, birth weight, growth parameters, motor, and cognitive development, sex-specific factors, age, highest, handedness, and nutritional status. So, from the above review, it can be concluded that hand grip strength declines highly with age [35]. Research questions 3 and 4 help to know about the functional dependency, mobility, and cognitive status affecting the quality of life and emotional, physical, and functional status of the elderly person decline in overall quality of life, respectively. Thus, in Table 3, the functional dependency, mobility, and cognitive status of QoL and its outcome measurement have been depicted. It indicated that the person with a bad score and low grip strength hands a late discharge. Hand grip measurements and functional assessment were also compared between inhabitants among community dwellers and geriatric nursing residents. Thus, it

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concluded that nursing resident patients had lower hand grip strength. Thereafter, the physical, functional, and emotional status of the elderly population's quality of life is shown in Table 4. The findings revealed that the relationship status has varied in physical, functional, and emotional status in the elderly quality of life and its relationship significantly varied based on age, gender, and other status. Finally, it is proved that hand grip strength has a correlation with overall health in the elderly.

5. LIMITATIONS OF A STUDY

This paper reviewed the grip strength and quality of life of the elderly population. Many studies have been employed to explore the quality of life among various age categories of people. However, while measuring the hand grip, the severity conditions of elderly people like blood pressure, cardiovascular diseases, and diabetes were not seen in many studies. Moreover, these diseases' severities were also not mentioned. Further, some articles rendered a self-reported analysis. Lastly, most of the articles stated that the studies were done on urban populations. There were not many studies on rural populations, which might have altered the results.

6. CONCLUSIONS

This paper analyzed the association between grip strength and quality of life among older people. Further, this review analyzes the grip strength factors that are responsible for the decline in grip strength. Moreover, it also considered functional dependency, mobility, and cognitive status affecting the QoL. The review concluded that the hand grip strength has declined with age. Further, grip strength also declined with various diseases of the elderly, whereas HGS also correlated with the overall health of elderly people. Finally, the review revealed that due to decreased grip strength, functional and cognitive dependency may contribute to a decline in the QoL in the elderly. Most of the research focused on restoring quality of life; however, future studies should focus more on other traits like balance, falls, and gait disorders to enhance the QoL by restoring the normal hand grip in the elderly.

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