



A REVIEW ON THE RELIABILITY OF HAND GRIP STRENGTH (HGS) AS NUTRITION SCREENING TOOL IN CANCER PATIENTS

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Abstract

Hand grip strength (HGS) is a non-invasive, simple and inexpensive test that has been used to assess nutritional status among various populations, including cancer patients. Several studies have proved that HGS is inversely correlated with body weight, fat-free mass, and lean body mass among cancer patients. Additionally, a low HGS has been associated with increased risk of mortality, morbidity, and poor quality of life in cancer patients. However, the reliability of HGS as a nutrition screening tool in cancer patients is still being debated. All eighteen research studies were analysed, two studies from India presented low muscle strength among breast cancer and lung cancer patients. Thirteen studies involving large participants strongly recommend and validate the use of hand grip strength among cancer patients. Three studies tested the use of hand grip strength among the participants and concluded that low hand grip strength is an indicator for patient's prognosis and mortality under cancer treatment. But only one study conducted among 63 participants in Japan among patients in Lenvatinib treated unresected hepatocellular carcinoma depicted that decreased grip strength was a poor prognostic factor among these patients. Some studies have found that HGS is a reliable and valid measure of nutritional status in cancer patients, while others have found that it is not. The variability in findings may be due to differences in study design, patient population, and methods used to measure HGS. Overall, the evidence suggests that HGS may be a useful tool for screening for malnutrition in cancer patients. However, more research is needed to determine its optimal use in this population as it provides a road map to develop strategies to improve muscle mass and test the effectiveness of nutrition intervention among cancer patients.

Keywords: malnutrition, hand grip strength, nutrition assessment tools, undernutrition, nutritional status, grip strength, cancer treatment, physical function.

Introduction :

Malnutrition is widely prevalent among oncology patients[1]. The incidence of cancer survivors are increasing due to advances in early-detection technologies and better treatment strategies for cancer[2]. For many years, investigations have been performed in the area of malnutrition, and more attention has been paid to muscle mass loss, which occurs in 80% of patients with cancer and is a first step toward malnutrition[3]. Among the important characteristics of malnutrition in these patients,

there is loss of strength , muscle activity and reserves frequently have a negative effect on treatment and clinical outcome[4]. Although muscle strength might only be indirectly related to overall function, this was often a useful prognostic marker[5]. Hand grip strength (HGS) is considered a reliable instrument to predict the total skeletal muscle mass[6] and previous study showed that HGS could be used as a predictor of malnutrition in individuals with cancer[7]. Hand grip strength (HGS) is a simple and effective method for measuring muscle strength, which is easy to perform and has low associated costs. Reportedly, HGS can provide important additional prognostic information for malignancies[8,9] . Handgrip strength (HGS) is the force involving the movement of fingers and wrist and the use of the forearm muscles. Generally, HGS declines with increasing age at a rate of approximately 1% annually after midlife [10]. However, a sex-specific difference in HGS is apparent, where men have higher HGS than women on average levels and have faster HGS decline [11,12]. More strikingly, HGS replaced the muscle mass as the primary criterion to define sarcopenia[13]. However, the impacts of HGS on cancer patients remain controversial[14,15]. Cancer is a major health challenge worldwide; a recent report estimated 19.3 million new cancer cases in 2020. With this number expected to increase to 27.5 million by 2040[16,17]. Therefore the objective of this review is to investigate the suitability or reliability of hand grip strength as a marker and an one of the tools to assess malnutrition among patients suffering from cancer.

Literature survey:

A systematic review of eighteen studies on the use of hand grip strength to detect malnutrition in cancer patients from the year Marie et al., 2017 till Pascal Tribolet et al., 2022 through google scholar from journals which are scopus indexed , Pub Med Central , Elsevier , BMC Geriatrics, Springer Link , EJCN , BMJ open , National Cancer Institute ,diseases of esophagus and MDPI have been analysed. In addition to this other we searched other papers published in journals like Himalayan Institute of Medical Sciences, Journal of Cachexia , sarcopenia and muscle , PLOS ONE , Nutrition and Cancer. Key words such as ‘hand grip strength’ , ‘ sarcopenia’ , ‘malnutrition’ , ‘grip strength’ ‘physical function’ were used to search data . Title was analysed to ensure the study is performed in cancer patients . All eighteen studies with small and large sample size was tabulated and noted . The data consisting of author, year, country , diagnosis , study design , sample size , results and conclusion was tabulated.

In addition data on inclusion and exclusion criteria was assessed , the type of dynamometer used (manual/digital) , standard operating procedure also recorded.

Hand grip strength as a marker of nutritional status:

Author/year/ country	Diagnosis	Design	Sample size	Results/conclusion
Victoria et at., 2019 [1] Spain	advanced-stage cancer inpatients	prospective	282	SGA and GLIM criteria, especially with HGS, are useful tools to diagnose malnutrition and have a similar predictive value regarding six-month mortality in cancer inpatients.
Nélia et al., 2020 [2] Brazil	All cases of cancer inpatients	retrospective	76	HGS was more sensitive to identify individuals at risk of malnutrition compared to other recognized indicators of nutritional status, indicating its application in a hospital setting with cancer patients.
R. D. Kilgour et al., 2013 [3] Canada	advanced forms of non-small cell lung and gastrointestinal cancers.	Consecutive cohort	203	HGS is independently associated with survival and important biological, functional, and quality of life characteristics in advanced cancer patients.
Mengmeng Song et al., 2021 [4] China	all patients with cancer cachexia	retrospective cohort	8466	Low HGS was associated with poor 1 year survival of patients with cancer cachexia

Cheng-Le Zhuang, et al.,2020 [5]China	all cancer patients	retrospective cohort	8257	low HGS was strongly associated with cancer mortalities.
Hailun Xie 2022 [6]China	all cancer in-patients	Prospective	14682	simple and practical H-CXI is a promising predictor for cancer cachexia and prognosis in patients with cancer
Dong-Dong Huang et al.,2022 [7] China	Patients who underwent radical gastrectomy for gastric cancer	Prospective	1359	GLIM criteria using HGS is a useful tool to diagnose malnutrition and has a similar or even better predictive value for postoperative complications and long-term survival after radical gastrectomy for gastric cancer compared with GLIM criteria using Skeletal mass index
Katarina et al., 2019 [8] Brazil	All cancer in-patients	Descriptive ,Cross-sectional	80	APMT and Handgrip Strength can be used with criterion in patients with cancer as complementary methods to evaluate nutritional risk and the need for nutritional intervention.
Hyunji Kim, et al., 2021 [9] Korea	cancer survivors Vs healthy individual	case controlled	392	For cancer survivors, low HGS was associated with poor QOL in some domains. Strategies to increase muscle strength must be considered to improve the QOL of cancer survivors.
Marie et al., 2017[10]	digestive cancer patients on chemotherapy	prospective	209	HGS testing is routinely feasible, inexpensive, and well accepted by patients and medical teams in an ambulatory digestive cancer unit.
Daisuke Kurita et al., 2020 [11]	post operative thorascopic laproscopic esophagetomy for patients with esophageal cancer	retrospective	161	low handgrip strength, as a simple and modifiable parameter, is associated with a higher risk of depression in cancer survivors.
Pascal Tribolet et al., 2022[12] Switzerland	hospitalized malnourished cancer patients	randomized controlled trial	628	Data provides evidence of the prognostic implications of HGS measurement in cancer patients and validate the prognostic value of handgrip strength in regard to long-term mortality.
Alba et al ., 2021 [13] Spain	Breast cancer survivors	Cross-sectional	60	results suggest that HGS may be a good indicator of self-reported PF and HRQoL in female BC survivors.
Vengadesan Kowshik et al., 2021[14] India	Head and neck cancer patients	Cross-sectional	44	a significant reduction in HGS, HGE in patient with HNC which denotes decreased skeletal muscle function and it is linearly associated with low muscle mass, body cell mass and phase angle.
Ana et al., 2017[15] Portugal	Non-resectable lung cancer	Cross-sectional	37	Handgrip dynamometry can be a useful tool to evaluate the functional and nutritional status. It can be included in lung cancer patients evaluation, along with other nutritional assessment tools.
Amit Sharma et al., 2017 [16] India	Breast cancer	Observational	12	The present study shows decrease in hand grip and pinch grip strength post-radiotherapy following modified radical mastectomy in breast cancer subjects. The study emphasizes the role of long term physiotherapy and rehabilitation of the patients[17

Jeongki Paek, 2019[17] Korea	Cancer survivors	Population-based cross-sectional	1037	Weak HGS was associated with impaired HRQoL in cancer survivors. Future longitudinal studies are needed to confirm the causality between HGS and HRQoL in cancer survivors.
Aini et al., 2020 [18] Malaysia	malnourished gynaecological cancer outpatients	observational	69	HGS is a simple objective indicator of functionality and is, therefore, a valid item to be measured when assessing QOL of malnourished GC outpatients
qKei Endo et al., 2020[19] Japan	HCC received a lenvatinib treatment	single-centre cohort	63	In addition to a low hepatic functional reserve, low muscle strength was a poor prognostic factor in u-HCC patients treated with lenvatinib.

Discussion :

Hand grip strength (HGS) is a force applied through the movement of fingers, wrist and forearm. HGS varies based on gender , age and disease condition such as cancer . HGS declines with age, less in women compared to men and different among healthy population. Cancer increases the disease burden on patients and impacts on their strength. We conducted an in depth survey on the available research studies which focused on efficacy of hand grip strength among cancer patients and reviewed the recent guidelines which was the most recommended test to be a criterion in defining cancer cachexia. There have been currently western data available on cut-off values of HGS among cancer patients but there have been no large Indian studies were available [5]. Hand grip strength is positively associated with strength and muscle mass , negatively associated with sarcopenia, malnutrition and mortalities . It is the most inexpensive and non-invasive method in assessing muscle strength and sarcopenia. Still the use of hand grip strength was controversial therefore we analysed different study results and conclusion to evaluate it’s use in assessing nutritional status among cancer patients.

A prospective study involving 282 patients concluded that HGS can be one of the valuable tools to diagnose malnutrition and have a similar predictive value regarding six-month mortality in cancer inpatients. Another study involving 78 sample size was considered more sensitive to identify patients who are at risk of malnutrition compared to other indicators to assess nutritional status in cancer patients. It is independently associated with quality of life , survival and functional status among cancer patients. It is considered simple , non-invasive , promising useful tool in predicting malnutrition among patients with cancer cachexia and a predictive value for post operative long-term survival after radical gastrectomy for gastric cancer compared with GLIM criteria using Skeletal mass index , which is also tested and validated among digestive cancer unit patients and lung cancer survivors .

A low hand grip strength when assessed among cancer patients indicates poor quality of life , depicts reduced skeletal muscle mass and a simple objective indicator of functionality which is linearly associated with poor muscle mass, body cell mass and phase angle . One recent study conducted among 161 subjects suffering from oesophageal cancer reported that reduced functional capacity associated with high risk of depression and indicates future impact on mental health. Further cross-sectional research studies conducted among breast cancer and head and neck cancer patients also concluded as an indicator to assess their nutritional status. In addition to this low hand grip strength is independently linked to survival of cancer patients and associated with one year survival with cancer cachexia and strongly associated with mortality.

A single centre cohort study conducted in Japan among patients with hepatocellular cancer treated with lenvatinib presented low hepatic functional reserve therefore low hand grip strength was considered as poor prognostic factor and not validated. As the drug lenvatinib also increases proteinuria .

Conclusion : Based on the review of all the prospective , retrospective and large population research studies on the use of hand grip strength in cancer patients available from Asian and Western countries answers our research questions involving the reliability and the use of hand grip strength to assess

nutritional status , identify sarcopenia , skeletal muscle mass , functionality and techniques involved among cancer patients. Hand grip strength is simple, non-invasive ,feasible technique that can be easily performed with simple training without any discomfort to patients . It is a reliable method to assess patient’s functional capacity which indicates as a prognostic factor during the treatment of cancer , a predictor of post surgical complication , depression , mortality and a low hand grip strength provides a road map to develop strategies to improve muscle mass and test the effectiveness of nutrition intervention among cancer patients.

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