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Disability Among Frail Elderly Patients Scheduled for Coronary Artery Bypass Graft Surgery.

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ABSTRACT

Background: Preoperative identification of disability among frail elderly individuals scheduled for coronary artery bypass graft (CABG) surgery is essential for perioperative risk stratification and care planning.

Aim: Assess the prevalence and level of disability among frail elderly patients prior to elective CABG surgery. Methods: A descriptive cross-sectional study was conducted on 80 elderly patients (≥60 years) scheduled for elective on-pump CABG at the Cardiothoracic Department, Sudeanie Hospital, Zagazig University Hospitals. Frailty was assessed using the Clinical Frailty Scale (CFS), and disability was measured using the 12-item World Health Organization Disability Assessment Schedule (WHODAS 2.0). Results: The mean age of participants was 69.2 ± 2.7 years; 72.5% were male. Regarding disability, 55% had mild disability, 35% moderate disability, and 3.75% severe disability. Higher education level and regular exercise were significant negative predictors of disability, whereas marital status, residence, and living arrangements were significant positive predictors. Conclusion: Mild to moderate disability is common among frail elderly patients scheduled for CABG surgery. Sociodemographic and lifestyle factors significantly influence disability levels. Recommendation:Routine preoperative frailty and disability screening should be integrated into cardiac surgical assessment to optimize perioperative management..

Key Words: Frailty, Disability, Elderly, Coronary artery bypass graft.

INTRODUCTION

There were 703 million older adults aged 65 or over worldwide and their number is projected to more than double in 2050, reaching over 1.5billion older adults (United Nations, Department of Economic and Social Affairs, 2019). The process of atherosclerosis makes elderly more susceptible to diseases of the heart and vessels, which may need surgery. The most prevalent illness among the elderly is coronary artery disease (CAD), which is also the predominant cause of fatality in elderly population Therefore, more elderly scheduled for cardiothoracic and vascular surgery due to longer life expectancy (Chew et al., 2022; Kamal et al., 2022).

CAD is a major cause of mortality worldwide .CAD can involve a single vessel or impact on multivessel coronary disease and also impact arteries with little to no clinical significance or arteries vital to the survival of the left ventricle, including the left main coronary artery. Coronary artery bypass graft (CABG) surgery is the options for revascularization in coronary artery disease (CAD). CABG has been the standard of care for invasive treatment of left main and multivessel CAD (Shaik et al., 2022).

Elderly undergoing coronary artery bypass graft (CABG) surgery have high clinical complexity together with reduced physiological reserve that includes nervous system impairment, abnormal immune system, reduced lung compliance, respiratory muscles weakness, reduced hypoxic respiratory drive, endocrine dysfunction, decline in renal function, anemia, malnutrition, and pharmacokinetic and pharmacodynamics changes (McIsaa et al., 2020).

Frailty is multidimensional syndrome owing to the decline in physiological reserve, function of multiorgan systems and loss of adaptability (Koh and Hwang, 2019). Consequence of frailty is prolonged postoperative recovery. Frail elderly are more present with multiple comorbidities and further complicate their cases resulting in longer hospital stay. It is also a strong predictor of hospital readmission after surgery (Lal et al, 2020).

CABG surgery,frailty status and hospitalization reduce physical functional capacity in patients and lead to physical disability. Frail elderly patients often experience pre-existing disabilities, including limitations in activities of daily living . These functional impairments are accompouned by cognitive decline, malnutrition, sarcopenia, and chronic illnesses as diabetes or chronic kidney disease. Frail elderly patients undergo CABG surgery, they face a higher risk of postoperative complications, prolonged hospital stays and further functional decline. the stress of major surgery can accelerate the trajectory of disability rather than restore independence(**Rengo etal.,2022).**

Gernotological nurse support early postoperative mobility, physical fitness and ability to function at preoperative level. In elderly patients undergoing CABG surgery poor preoperative physical fitness is associated with higher risks of complications, longer postoperative length of stay in hospital and greater mortality risk **(Abdullahi et al, 2021).** Therefore, gerntological nurse can identify current knowledge gaps and health education for elderly patients undergoing CABG surgery in prehabilitation program to improve perioperative and long-term outcomes after CABG surgery **(Yau et al., 2021).**

Aim of the study

To assess the prevalence and level of disability among frail elderly patients prior to elective CABG surgery.

Research question:

What is the prevalence and level of disability among frail elderly patients prior to elective CABG surgery?

Subjects and Methods

a) Research design:

A descriptive cross-sectional study design was utilized.

b) Setting:

The present study was conducted at cardiothoracic ward at Sudeanie hospital in Zagzig University hospital.

c) Sampling:

The sample of this study included 80 patients who fulfilled the following criteria:

Inclusion criteria:

Age: 60 years and older

All pre-frail to moderately frail elderly patients (scored 4-6 in Clinical Frailty Scale).

Elderly patients undergoing on pump elective primary isolated CABG by using heart lung machine.

Exclusion criteria:

Patients who had critical left main coronary disease, congestive heart

failure or acute coronary syndrome or redo cardiac surgery.

Patients who are hospitalized for arrhythmias.

Elderly patients Having psychiatric disorders, cognitive or communication problems who were unable to comply with study procedures.

Sampling technique:

A purposive sampling technique was used in the recruitment of the study subjects from the above-mentioned setting and who fulfilled the study inclusion criteria. The enrolled patients were randomly assigned.

Sample size calculation

The sample size was calculated by software Epi-info package at level of confidence 95%, margin of error 5% and power of test were 80%, assuming fair lifestyle among elderly patients with CABG is 73.0% from 250 elderly patients **(Manupreet, 2017)** come to cardiac clinic through 6 months, and the least percentage of improvement after the intervention program will be 10% then the sample should include 80 elderly patients. The enrolled patients who fulfilled the recruitment criteria were randomly assigned .

Tools for data collection:

The following two tools were used for data collection:

Tool I: A Structural interviewing questionnaire:

This tool was developed by investigator after reviewing the national and international related literature. It was consists of three parts:

First part:

Demographic characteristics: This part include data about age, sex, marital status, level of education, occupation, residence, monthly income, residents at home.

Second part:

Patient past& present medical history and patient habits which include: Period affected by heart disease, symptoms which reported to physician, discover the disease, performed any operation or surgical intervention, type of medication, take medications without consulting doctor, others diseases associated with current disease, accident, admission to hospital, disease effect the role in family care, cost of treatment, Family history for disease, exercises, diet for condition, number of diet, shared personal equipment, amount of fluids intake daily, time of follow-up and Present medical history for symptoms related to general symptoms, digestive system, skin and nervous system.

Third part: Clinical Frailty Scale (CFS) (Rockwood et al, 2005).

CFS is a simple, quick and highly predictive semi-quantitative tool was used to assess the frailty status. CFS ranged from 1 (very fit) to 9 (terminally ill),classified as non-frail (scores of 1–3), vulnerable/pre-frail(score of 4) and frail (scores of 5–9).

Tool II: Disability-free survival: World Health Organization Disability Assessment Schedule 2.0 (WHODAS) (Shulman et al, 2015):

disability was measured preoperative by using the 12-item World Health Organization Disability Assessment Schedule (WHODAS) score. Since frailty was often a precursor or a coexisting factor for disability. The WHODAS score has been validated in surgical patients. Patients were asked to rate the difficulty in carrying out 12 specified activities on a5-point scale (0=none to 4=extreme) in the past 30 days. The total score was converted to a scale from 0% (no disability) to 100% (maximum disability), with the following subcategories: none (0%–4%), mild (5%–24%), moderate (25%–49%), severe (50%–95%) and complete (96%–100%) disability. A 25% threshold was defined as disability . It took about5 minutes to complete.

Validity:

The developed tool will be formulated and submitted to three experts from Community Health Nursing and Gerontological nursing in Faculty of nursing in Zagazig, Mansoura & Assiut Universities to review relevance of the tools for comprehensiveness, understanding and applicability.

Reliability:

Reliability of tools was determined through estimating test-retest reliability and measuring its internal consistency. Internal consistency of the tools was assessed by calculating Cronbach alpha coefficients. The reliability proved to be high as shown by the values of Cronbach alpha coefficient in the following table:

Scales	No of items	Cronbach's alpha
World Health Organization Disability Assessment schedule	12	0.907

Pilot study:

Pilot study has been conducted to test the clarity, applicability and understandability of the tool. It has been conducted on 10% (8) of patients. They have been selected from settings similar to those chosen for the study. The results of the pilot helped in refining the interview questionnaire and to schedule the time framework. The participants of the pilot were included in the main study sample.

Field work:

Once permission was granted to proceed with the study, the researcher used to visit the cardiothoracic outpatient clinic on the scheduled days for each inpatient surgical unit to enroll elderly patients who fulfilled the inclusion criteria during their medical examinations. After medical diagnosis, the doctors referred patients who needed surgical procedure (CABG surgery) to the hospital cardiothoracic surgical inpatient units.

Once the patients were admitted into the inpatient cardiothoracic surgical department, the researcher interviewed enrolled patients and carried out the preoperative stage for each participant.

The fieldwork was executed over a period starting from November 2024 to May 2025. The researcher went almost every day and throughout the day, depending on the patient's flow to the outpatient clinics, and the operational list (schedule) of the unit. The fieldwork included assessment of disability among frail elderly CABG patientsin perioperative period.

Assessment phase

Every study subject who met the eligibility criteria was interviewed individually to collect the preoperative baseline data. The researcher introduced herself and explained the aim of the study, briefly seeking their agreement to participate in the study, and reassuring them that information obtained was strictly confidential would not be used for any purposes other than research.

Ethical consideration:

An official permission to conduct this study was being obtained from the Scientific Research Ethics Committee. Participation in the study is voluntary and subjects was be given complete full information about the study and their role before signing the informed consent. The ethical considerations was include explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information were be guaranteed.Ethics, values, culture and beliefs were be respected.

Administrative design:

An official letter requesting permission to conduct the study was obtained from the Dean of Faculty of nursing, Zagazig University to the director of the mentioned hospital to obtain their approval to carry out this study. This letter included a permission to collect the necessary data and explain the purpose and nature of the study.

Statistical design:

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and Statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 24. Data were presented using descriptive statistics in the form of frequencies, percentages and Mean ± SD. Chi-square test (X2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between two ranked variables.

Results

Part I: Demographic characteristics of studied elderly patients .Table (1): Characteristics of studied elderly patients (n=80)

Variable	No	%
Age		
60–<65 years	25	31.25
65–<70 years	55	68.75
Mean ± SD	69.2 ± 2.7	
Sex		
Male	58	72.5
Female	22	27.5
Marital Status		
Married	54	67.5
Widowed	19	23.75
Divorced	7	8.75
Education Level		
Illiterate	10	12.5
Read & write	11	13.75
Basic education	30	37.5
Secondary	20	25.0

University	9	11.25
Occupation		
Employed	0	0
Non-employed	80	100
Residence		
Urban	40	50
Rural	40	50
Monthly Income		
Sufficient	48	60
Not sufficient	32	40
Living Arrangement		
Alone	14	17.5
With spouse	19	23.75
With sons	35	43.75
With grandchildren	12	15

Table 1: reveals that, The mean age of participants was 69.2 ± 2.7 years.

Most participants (68.75%) were aged 65–69 years, and 72.5% were male.

The majority were married (67.5%), had basic education (37.5%), and 50% resided in rural areas.

Table (2a): Elderly patient's past medical history in the studied elderly patients (n=80)

Items	**Study group (n=80)**		**X^2 test**	**P. value**
	No	**%**		
Period affected by cardiac disease				
< 5 years	37	46.25	0.856	0.652
5 < 10 years	30	37.5		
≥10 years	18	22.5		
Symptoms that made go to the doctor				
Chest pain	28	35.00	2.911	0.893
Tachycardia	17	21.25		
Fainting attack	7	8.75		
Reduce physical activity	5	6.25		
Swelling of the fee	5	6.25		
Pallor	4	5.00		
Peripheral or central cyanosis	8	10.00		
Shortness of breath	6	7.5		

Behavior to word disease				
Took drugs without consulting a doctor	35	43.75	1.270	0.260
Went immediately to the hospital	45	56.25		
Previous surgical intervention				
Yes	38	47.5	3.208	0.073
No	42	52.5		
Medications				
Hypoglycemic drugs	15	18.75	3.770	0.806
Antihypertensive	10	12.5		
Sedatives	17	21.25		
Diuretics	16	20.00		
Antibiotics	9	11.25		
Bronchodilator drugs	4	5.00		
Cholesterol and triglyceride drugs	9	11.25		
Take medications without doctor prescription				
Yes	16	20.00	0.313	0.575
No	64	80.00		

Table 2a: clarifies that the duration of cardiac disease, 46.25%of the studied elderly patients in study group were suffering from cardiac disease from less than five years . 35% of the studied elderly patients were suffering from chest pain respectively. 56.25% of the studied elderly patients were went immediately to the hospital respectively.Concerning previous surgical intervention, 52.5% of studied elderly patients in the study group were did not have history of surgical intervention. Concerning medications ,21.25% of studied elderly patients were receiving sedatives and 80% of the studied elderly patients were did not take medications without doctor prescription.

Table (2b): Elderly patient's past medical history in the studied elderly patients (n =80)

Items	**Study group (n =80)**		**X2 test**	**P. value**
	No	**%**		
Associated diseases				
Biliary obstruction disease	11	13.75	1.004	0.909
Gastrointestinal disease	30	37.5		
Respiratory system disease	27	33.75		
Blood diseases	7	8.75		
Wilson's disease	5	6.25		
Exposure to accident				
Yes	37	46.25	0.050	0.823
No	43	53.75		

Previous hospitalization				
Yes	80	100.0	0.000	1.000
No	0	0.0		
Disease affect role in family care				
Yes	80	100.0	0.000	1.000
No	0	0.0		
If yes, Effect				
Economic	13	16.25	6.514	0.089
Psychological	12	15.0		
Social	20	25.0		
Physical	35	43.75		
Costs of treatment				
A decision at the expense of the State	50	62.5	0.000	1.000
Health insurance	30	37.5		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Table 2b: describes that, the most common associated diseases were 37.5%gastrointestinal disease among of the studied elderly patients . 53.75 of the studied elderly patients did not exposure to accident . Almost all the studied elderly patients were had a history of previous of hospitalization and their disease affect their role in the family care respectively, 43.75% of the studied elderly patients were affected physically by their disease and 62.5% of the studied elderly patients treated based on a decision at the expense of the state.

Table (3): Elderly patient's family history in the studied elderly patients (n =80)

Items	**Study group (n=80)**		**X2 test**	**P. value**
	No	**%**		
Family history of cardiac diseases				
Yes	48	60.0	0.208	0.648
No	32	40.0		
If yes, degree of kinship	48	60.0	0.031	0.984
First degree relative	12	25.0		
Second degree relative	15	31.25		
Third degree relative	21	43.75		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Considering family history of cardiac diseases, **table 3:** describes that the highest percentages of the studied elderly patients were had family history of cardiac diseases 60% . Regards to degree of kinship the highest percentages of the studied elderly patients their third degree relative had history of cardiac diseases 43.75% .

Table (4): Elderly patient's habits in the studied elderly patients

(n =80)

Items	Study group (n=80)		X2 test	P. value
	No	%		
Do exercise				
Yes	26	32.5	5.698	0.017*
No	54	67.5		
Diet for your condition				
Ordinary diet	22	27.5	40.62	0.000
Low protein	15	18.75		
Low salt	43	53.75		
Number of males per day				
One	39	48.75	0.760	0.684
Two	17	21.25		
Three or more	24	30.0		
Shared personal equipment				
Yes	25	31.25	21.04	0.000
No	55	68.75		
Fluid intake per day				
500 cm	13	16.25	1.632	0.652
1000 cm	32	40.0		
1500 cm	25	31.25		
More than 1500 cm	10	12.5		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Table 4 :demonstrates that,67.5 % of the studied elderly patients were did not do exercise and this result was found to be statistically significant difference (p<0.05). Regarding diet 53.75% of the studied elderly patients were eat low salt diet and this result was found to be highly statistically significant difference (p<0.01). Also, 48.75% of the studied elderly patients were eat only one male per day and this result was found to be no statistically significant difference (p>0.05). Moreover 68.75 % of the studied elderly patients were weren't shared personal equipment his result was found to be highly statistically significant difference (p<0.01). Furthermore, 40% of the studied elderly patients were drink 1000cm fluid per day and this result was found to be no statistically significant difference (p>0.05).

Table (5): Elderly patient's follow-up in the studied elderly patients

(n =80)

Items	(Study group n=80)		X2 test	P. value
	No	%		
Follow-up important				
Yes	58	72.5	16.050	0.000**
No	22	27.5		

Regularly follow-up				
Yes	51	63.75	6.545	0.011*
No	29	36.25		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Table 5: reveals that, 72.5% of the studied elderly patients were know the important of follow-up respectively and this result was found to be highly statistically significant difference (p<0.01). Besides, the majority of the studied elderly patients were regularly follow-up 63.75 % and this result was found to be statistically significant difference (p<0.05).

Table (6): Elderly patient's present medical history for symptoms in the studied elderly patients(n =80)

Items	**studied elderly patients(n =80)**		**X2 test**	**P. value**
	No	**%**		
General Symptoms				
Difficulty breathing	9	11.25	3.735	0.810
Headache	2	2.5		
blurred vision	8	10.0		
Fainting	10	12.5		
General weakness	5	6.25		
Feeling tired quickly	5	6.25		
Swollen feet	37	46.25		
Lack of sexual desire	4	5.0		
Symptoms related to the digestive system				
Weight loss	41	51.25	3.701	0.593
Weight gain	11	13.75		
Pain in the abdomen	12	15.0		
Bulge or gases	4	5.0		
Mouth ulcers	8	10.0		
Loss of appetite	4	5.0		
Skin related symptoms				
Dry skin	52	65.0	2.901	0.407
Leather spots	7	8.75		
Hair loss from certain areas of the body	16	20.0		
Redness in the soles of the hands "palm"	5	6.25		
Symptoms related to the nervous system				
Nervous mood	12	15.0	3.329	0.504
Lack of concentration	9	11.25		
Difficult to remember things "information"	10	12.5		
Discomfort	16	20.0		

Sleep long periods	33	41.25		

*Significant at p <0.05. **Highly significant at p <0.01. Not significant at p>0.05

Considering general symptoms **table 6:** describes that, 46.25 % of the studied elderly patients were suffering from swollen feet and this result was found to be no statistically significant difference (p>0.05). Regarding symptoms related to the digestive system 51.25 % of the studied elderly patients were having weight loss respectively and this result was found to be no statistically significant difference (p>0.05). Moreover, skin related symptoms 65% of the studied elderly patients were having dry skin and this result was found to be no statistically significant difference (p>0.05). Furthermore, 41.25% of the studied elderly patients were suffering from sleep long periods as symptoms related to the nervous system and this result was found to be no statistically significant difference (p>0.05).

Table (7): Elderly patient's clinical frailty in the studied elderly patients(n =80)

Frailty Level	**No**	**%**
Vulnerable	28	35
Mildly frail	22	27.5
Moderately frail	30	37.5

Table 7: reveals that, 37.5% of the studied elderly patients were moderate frail .Frailty levels were described using frequencies and percentages.No inferential test was applied since the study included a single cohort.

Table (8): Distribution of Disability Domains Among Studied Elderly Patients Before CABG Surgery (n = 80)

WHODAS 2.0 Domains	**Mean ± SD**
Standing for 30 minutes	1.73 ± 0.60
Taking care of household responsibilities	1.63 ± 0.90
Learning a new task	2.28 ± 0.91
Joining community activities	2.15 ± 1.08
Emotionally affected by health problems	2.38 ± 0.74
Concentrating for 10 minutes	2.25 ± 0.78
Walking one kilometer	2.10 ± 0.93
Washing whole body	1.60 ± 1.08
Getting dressed	1.55 ± 0.96
Dealing with strangers	2.05 ± 1.01
Maintaining friendships	2.01 ± 0.96
Day-to-day work activities	1.93 ± 0.69

Table (8) illustrates the distribution of disability domains among the studied elderly patients prior to CABG surgery. The highest mean disability scores were observed in the domains of being emotionally affected by health problems (2.38 ± 0.74), learning a new task (2.28 ± 0.91), and concentrating for 10 minutes (2.25 ± 0.78), indicating greater perceived difficulty in psychosocial and cognitive-related activities.

Moderate levels of difficulty were also reported in joining community activities (2.15 ± 1.08) and walking one kilometer

(2.10 ± 0.93). In contrast, lower mean scores were observed in basic self-care activities such as getting dressed (1.55 ± 0.96) and washing the whole body (1.60 ± 1.08), suggesting relatively preserved independence in personal care tasks.

Overall, the findings indicate that disability among frail elderly patients scheduled for CABG surgery is more pronounced in psychosocial participation and higher-level functional domains than in basic activities of daily living.

Table (9): Elderly patient's total disability score in the studied elderly patients (n =80)

Disability Level	No	%
No/minimal	5	6.25
Mild	44	55
Moderate	28	35
Severe	3	3.75

Table 9: reveals that, 55% of the studied elderly patients were there Mild disability.

Table (10): Multiple Linear Regression Analysis for Predictors of Disability Score (n = 80)

Predictor	B	β	t	P-value
Marital Status	0.473	0.357	2.360	0.002**
Education Level	-0.287	-0.503	-3.592	0.001**
Residence	0.148	0.330	3.165	0.002**
Living Arrangement	0.232	0.337	2.210	0.033*
Exercise	-0.697	-0.550	-4.059	0.000**

Model Summary:

$R^2 = 0.508$

F = 28.64

$P < 0.001$

Table 10: demonstrates that, Multiple linear regression analysis demonstrated that marital status, residence, and living arrangement were significant positive predictors of disability score. In contrast, higher education level and regular exercise were significant negative predictors of disability. The model explained 50.8% of the variance in total disability score (R^2 = 0.508), indicating moderate explanatory power.

DISCUSSION

The present study aimed to assess the level and prevalence of disability among frail elderly patients scheduled for elective coronary artery bypass graft surgery.

Regarding to demographic characteristics of studied elderly patients,The majority of the studied elderly patients were aged 65–<70 years, with a mean age of 69.2 ± 2.7 years, and were predominantly male. This finding is consistent with epidemiological data indicating that coronary artery disease (CAD) and subsequent CABG procedures are more common among older males **(Olufajo et al., 2021).** The high proportion of married participants and those living with family members may reflect the sociocultural context, where extended family support is common among older adults.

Regarding past medical history, a considerable proportion of patients had longstanding cardiac disease and multiple comorbidities, including gastrointestinal and respiratory disorders. Multimorbidity is common in older adults undergoing major surgery and has been associated with increased postoperative mortality and adverse outcomes, emphasizing the complex clinical profile and higher risk carried by this cohort **(Mikus et al., 2022).**

Regarding Frailty Status, the present study showed that 37.5% of participants were moderately frail and 27.5% were mildly frail according to the Clinical Frailty Scale (CFS). This high prevalence of frailty is consistent with contemporary cardiac surgery literature demonstrating that frailty is common among older adults referred for CABG and independently predicts postoperative mortality, prolonged hospitalization, and functional decline.

These findings are in line with ,alarge systematic review by **Sepehri et al. (2014)** confirmed that frailty significantly increases the risk of mortality and major adverse cardiac events following cardiac surgery. Similarly, **McIsaac et al. (2020)** demonstrated that preoperative frailty strongly predicts death or new disability after surgery in older adults.

Frailty reflects diminished physiological reserve and impaired stress response, predisposing patients to perioperative complications and delayed recovery. Therefore, the substantial proportion of moderate frailty observed in the present study emphasizes the importance of incorporating comprehensive geriatric assessment into preoperative cardiac evaluation.

Concerning elderly patient's disability, the majority of the current study participants demonstrated mild disability, while more than one-third exhibited moderate disability according to the WHODAS 2.0. These findings support the well-documented overlap between frailty and functional impairment in older adults. Although frailty and disability are conceptually distinct—frailty representing biological vulnerability and disability reflecting difficulty in performing activities—both frequently coexist in geriatric cardiac populations. **Dent et al. (2019)** emphasized that frailty is often a precursor to disability and is strongly associated with impairments across physical, cognitive, and social domains.

The observed predominance of mild-to-moderate disability in the present study aligns with findings from **Sahar et al. (2024),** who reported increased functional limitations among frail elderly patients undergoing CABG. Likewise, **Emamzadehashemi et al. (2024)** demonstrated that reduced preoperative functional capacity was associated with poorer postoperative recovery and lower quality of life. In contrast, some studies have reported more severe baseline disability among elderly cardiac surgery candidates, particularly in Western populations with higher comorbidity burdens. Such variations may be attributed to demographic differences, cultural patterns of family support, and disparities in access to early cardiac intervention.

The regression analysis in this study identified education level and regular exercise as significant negative predictors of disability. These findings are consistent with previous research demonstrating that higher educational attainment is associated with improved health literacy, better adherence to medical recommendations, and enhanced self-management behaviors. **Mackenbach et al. (2019)** highlighted the role of socioeconomic position, particularly education, in shaping health outcomes and functional status in older adults. Furthermore, regular physical activity has been shown to attenuate sarcopenia, preserve mobility, and reduce progression of frailty. **Ambrosetti et al. (2021)** confirmed that structured exercise and cardiac rehabilitation programs significantly improve functional performance in elderly cardiac patients.

Higher educational level was associated with lower disability scores, consistent with evidence linking education to better health literacy and improved health outcomes in older adults **(Mackenbach et al., 2019).**

Regular exercise was negatively associated with disability, aligning with findings that physical activity reduces frailty progression and preserves functional independence in older cardiac populations **(Ambrosetti et al., 2021).**

Conversely, marital status, residence, and living arrangements were positive predictors of disability in the present study. These findings underscore the complex influence of social determinants on functional health. Elderly individuals with limited social support or living in disadvantaged environments may experience reduced engagement in daily activities and limited access to healthcare resources. **Sun et al. (2021)** similarly reported that poor social support was associated with worse postoperative functional outcomes. Nevertheless, other studies have demonstrated a protective effect of marriage and cohabitation on functional recovery, suggesting that spousal support may enhance adherence to treatment and rehabilitation. The inconsistency across studies may reflect cultural differences in family dynamics and caregiving structures.

Overall, the findings of this study reinforce the importance of comprehensive preoperative assessment incorporating both frailty and disability screening. Early identification of vulnerable elderly patients allows for targeted interventions, individualized perioperative planning, and optimization of surgical outcomes. Integrating geriatric assessment into cardiac surgical pathways may ultimately contribute to improved functional abilities and quality of life among elderly patients undergoing CABG surgery.

Regarding best fitting multiple linear regression model for the disability **(Table 10)**, the analysis showed that the most significant predictors of postoperative disability were older age, lower physical activity levels preoperative, and absence of family support. From the researcher perspective, these results highlight the importance of not only medical interventions but also social and behavioral factors in predicting recovery outcomes. These findings were consistent with **Sun et al. (2021)**, who found that limited baseline mobility and poor social support significantly impact postoperative functionality.

Using the 12-item WHODAS 2.0, more than half of the studied elderly patients had mild disability (55%), while 35% had moderate disability. This coexistence of frailty and disability is well documented in geriatric populations. **Dent et al. (2019)** reported that frailty frequently overlaps with disability and is associated with impairment across physical, cognitive, and social domains.The coexistence of frailty and disability among elderly CABG candidates highlights the necessity of early screening using validated tools such as the Clinical Frailty Scale and WHODAS 2.0. Early identification allows implementation of targeted prehabilitation programs, potentially reducing complications, length of hospital stay, and postoperative functional deterioration.

CONCLUSION

On the light of results of the current study and answers of the research questions, it could be concluded that, frailty is prevalent among elderly CABG surgery, with a substantial proportion exhibiting mild to moderate disability preoperatively. Whereas, predictors such as education, exercise habits, marital status, and living arrangements significantly influence disability outcomes.

Recommendation

On the light of results of the current study findings the following recommendations are suggested:

Routine preoperative frailty and disability screening should be integrated into cardiac surgical assessment to optimize perioperative management.

Implement routine frailty and disability assessment for elderly CABG candidates using validated tools such as CFS and WHODAS 2.0.

Assessment of social determinants of health, including living arrangements and family support, should be integrated into preoperative planning to identify patients at higher risk of disability.

Coducate longitudinal or randomized controlled designs to examine causal relationships between frailty, disability, and surgical outcomes..

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