The implement of Preoperative 11-items modified Frailty Index and the Surgical Apgar Score might predict the Postoperative Complication Rate in Old Patients undergoing Major Abdominal Surgeries: Observational Prospective Study

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Abstract

Background: Frailty is associated with significant diminution of physiologic reserve and worse postoperative (PO) outcomes after major abdominal surgeries (MAS).

Objectives are evaluation of the applicability of frailty indices (FI) and the Surgery Apgar score (SAS) for intraoperative events as predictors for the frequency and severity of 30-d PO complications as judged by the Clavien-Dindo classification and PO mortality rate (MR).

Patients and methods: 125 patients aged ≥60 years were evaluated preoperatively for frailty using the 11-item and 5-item modified FI (11-mFI & 5-mFI) and during surgery for intraoperative events using SAS. Patients were monitored for 30-d PO for development of complications according to the 5-grade Clavien-Dindo classification.

Results: The 11-mFI and 5-mFI detected 85 (68%) and 70 (56%) frail patients, respectively**.** Among non-frail patients 65% had SAS ≥7, while 77.6% of frail patients had SAS ≤4. Seven non-frail and 30 frail patients developed complications and one non-frail and 5 frail patients died. ROC curve analysis defined high frailty scores as the significant early predictors of SAS≤4 and low SAS with high 5-mFI score as significant predictors for frequency and severity of PO complications. Multivariate Regression analysis defined low SAS and high 5-mFI score as the significant predictors for PO complications and MR, respectively.

Conclusion: Low SAS is common among frail patients and both low SAS and high score on FIs might be used as early predictors for PO severe complications and mortality of patients undergoing major abdominal surgeries.

Keywords: Old patients; Major abdominal surgeries; Frailty indices; Surgical Apgar Score; Complication rate; Mortality rate.

DOI: 10.21608/SVUIJM.2024.298695.1900

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Received: 15 June,2024.

Revised: 1 July,2024.

Accepted: 4 July,2024.

Published: 12 July, 2024

Cite this article as: Tamer M. Allam, Yehya Shahin Dabour , Hany A. Shehab.(2024). The implement of Preoperative 11-items modified Frailty Index and the Surgical Apgar Score might predict the Postoperative Complication Rate in Old Patients undergoing Major Abdominal Surgeries: Observational Prospective Study. *SVU-International Journal of Medical Sciences*. Vol.7, Issue 2, pp: 299-312.

Introduction

The risk factors for postoperative (PO) complications after major abdominal surgeries (MAS) especially in elderly patients are enormous; low PO physical activity is significantly associated with high PO complication rate and prolonged hospital stay **(Hogenbirk et al., 2024)**. Early re-laparotomy that accounted for 6.8% after MAS is a major risk factor for PO complications in about 75% of patients had early re-laparotomy **(Amentie et al., 2024)**. The presence of Alzheimer's disease and its related dementias were independent risk factors for poor PO outcomes, the possibility of discharge to non-home settings and higher healthcare expenditures **(Khalil et al., 2024)**.

Frailty is defined as a multidimensional state that significantly reduced physiologic reserve and for patients planned to have MAS is associated with worse PO outcomes **(Khajoueinejad et al., 2024)** and has major implications in mortality after MAS beyond the typical 30-day follow-up period **(Sutherland et al., 2024)**. Frailty and comorbidities exposed elderly patients going to have MAS to increased risk of PO complications and treatment costs and must be optimized before surgery to improve surgical outcomes of such population **(Staiger et al., 2023)**. Preoperative frailty was also a risk factor for adverse outcomes of patients had surgery for inflammatory bowel diseases **(Rozich et al., 2023)**.

The use of the frailty index, the improvement in the perioperative care programs, improving quality of life and the surgical innovation allowed to access of complex MAS for elderly patients **(Reyes et al., 2023)**. Multiple nomograms were used for identification of high-risk patients for complication and possible mortality after MAS to aid in the prevention of complications and deaths after MAS **(Sutherland et al., 2024)**.

Considering the recent literature concerned with the impact of frailty on old patients planned to undergo MAS, the current study tried to compare the ability of the preoperative application of the frailty indices alone or in combination with the Surgery Apgar score (SAS) to stratify these patients and predict the possible PO complications graded according to Clavien-Dindo classification

Patients and methods

Study Design: Prospective observational study

Setting: Department of Anesthesia, Pain & ICU, Faculty of Medicine, Benha University in conjunction with multiple private centers, Benha and Cairo.

Patients : All patients aged ≥60 years who were planned to have MAS through the study duration since Jan 2022 till Jan 2024 were evaluated for requirements of enrollment in the study.

Exclusion criteria: Patients assigned to redo or revision surgeries, had Alzheimer disease or its related dementias or coagulopathy were excluded from the study. Also, patients of higher grades on ASA Physical Status (ASA-PS) ≥4 were also excluded from the study.

Inclusion criteria: Patients of ASA-PS grade I-III, aged ≥60 years, free of exclusion criteria and were planned to have MAS were enrolled in the study

The Study Protocol

All enrolled patients were subjected to collection of their personal and medical data and were discussed to get data required for fulfillment of the required items for the applied frailty indices. Operative data were collected to fulfill the requirements for calculation of SAS. During 30-d follow-up including the immediate PO

period, the frequency, type and severity of PO complications including the need for second-look intervention were recorded and graded according to Clavien-Dindo classification. The preoperative frailty indices were assessed as predictors for the calculated SAS. Also, the preoperative frailty indices and SAS grade were assessed as predictors for the complications' rate and severity according to Clavien-Dindo classification, and for the 30-day PO mortality rate (MR).

Trial registration

The study protocol was proposed for approval by the Anesthesia Departmental Committee before cases collection. At the end of the 30-day follow-up period for the last enrolled case, the study protocol was approved from the Ethics Committee, Benha Faculty of Medicine by the number RC:10-3-24.

Evaluation Tools

1. **The 11-item modified frailty index (mFI-11)**The mFI-11 entails inquiry about : the presence of manifest diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), myocardial infarction (MI), angina or cardiac interventional procedures, hypertension requiring medication, peripheral vascular disease, transient ischemic attack or cerebrovascular accident resulted or not in neurological deficit and impaired sensorium, and non-independent functional status **(Tsiouris et al., 2013)**. These items were scored using binary fashion of 0 or 1 to give a total score ranging between zero and 11. The resultant total score was divided by 11 to give a score of zero to 1 to grade frailty as non-frail, mild, moderate and severe frailty if the scores were 0-0.08, 0.09-0.17, 0.18-0.26 and ≥0.27, respectively **(Shin et al., 2017)**.
2. **The 5-item modified Frailty Index (mFI-5):** The mFI-5 evaluates the presence of DM, COPD, CHF, hypertension requiring medication and non-independent functional status only and these items were scored on 0-1 binary scale. Frailty was graded as non-frail at score of zero, pre-frail at score of 1, while a score of ≥2 indicated that patient is frail **(Chimukangara et al., 2017)**.
3. **Surgical Apgar Score (SAS):** This 10-point score evaluates three intraoperative events scored using a 5-point scale (0-4) for the lowest recorded hear rate (HR; beats/min) and lower score indicates maintained HR. The lowest mean arterial pressure (MAP; mmHg) and IO blood loss were evaluated using 4-point scale (0-3) with higher score indicates maintained MAP and the IO blood loss of <100 ml **(Gawande et al., 2007)**. A total score of zero indicates bad and 10 indicates excellent 30-d PO course as regards the development of PO complications.
4. **Clavien-Dindo classification:** Grades 1 and 2 of the 5-grade Clavien-Dindo classification of PO complication include complications that respond to medical interventions, grade 3 specify complication requiring surgical interventions under regional or local anesthesia (grade 3a) or under general anesthesia (grade 3b). Grade 4 included life-threatening complications that necessitated ICU admission for single organ dysfunction (grade 4a) or multi-organ dysfunction (grade 4b), while grade 5 defines that patient demise **(Dindo et al., 2004)**.

Sample size calculation

The study design was observational, so no sample size was calculated. The study null hypothesis is that frailty significantly increases the complication and mortality rates of aged patients underwent MAS, so it was supposed to divide patients arbitrary to frail and non-frail according to the 11-mFI because it covers much more items than the 5-mFI. The post-hoc power analysis, which is used to estimate the power of a test given an observed effect size, using G*power version 3.1.1 **(Faul et al., 2007)** with 0.05 type-I error and 0.5 effect size, the number of patients per group was suggested to be ≥40 to give the study a power of 80% and assure the reality of the null hypothesis.

Study outcomes

1. The primary outcome is the possibility of using the 11-mFI or the 5-mFI for early prediction of SAS, PO complication and mortality rates.
2. The secondary outcome is diagnostic yield of combined application of FI and SAS for the possibility of getting PO complications of ≥3 grade on Clavien-Dindo classification.

Statistical analysis

Statistical analyses were performed using IBM® SPSS® Statistics software (Version 22, 2015; Armonk, USA). The significance of the intragroup differences was assessed using One-way ANOVA test, and Chi-square test for the differences in percentage of data. Correlation between the independent variates including age, BMI, female gender, preoperative FIs and SAS and dependent variates including the complication and mortality –rates was evaluated using Pearson's correlation analysis. Univariate Regression analysis was used to assure the predictability of the correlated variates for the independent variates. The Receiver Operating Characteristic (ROC) Curve was conducted to refine the correlated variates as predictors for independent variates as judged by area under the curve (AUC) and its significance in relation to the area under the reference line (AUC=0.5). The Paired-sample analysis for difference in AUC was used to define the most significant predictor and this was assured by the Multivariate Regression analysis. The optimum cut off point for significance was $P<0.05$.

Results

The study included 125 patients of ASA-PS grade I-III, aged ≥60 years and underwent MAS during the study duration. Preoperative frailty evaluation using the 5-mFI, detected 55 non-frail patients (44%), 30 pre-frail patients (24%) and 40 patients (32%) were frail. However, frailty evaluation according to items of the 11-mFI detected 40 non-frail (32%) and 85 frail (68%) patients; 49 patients (57.6%) had mild frailty, 31 patients had moderate frailty and only 5 patients (5.9%) had severe frailty. According to the frailty assessment using 11-mFI, patients were divided into non-frail (n=40) and frail (n=85) groups (**Fig. 1**).

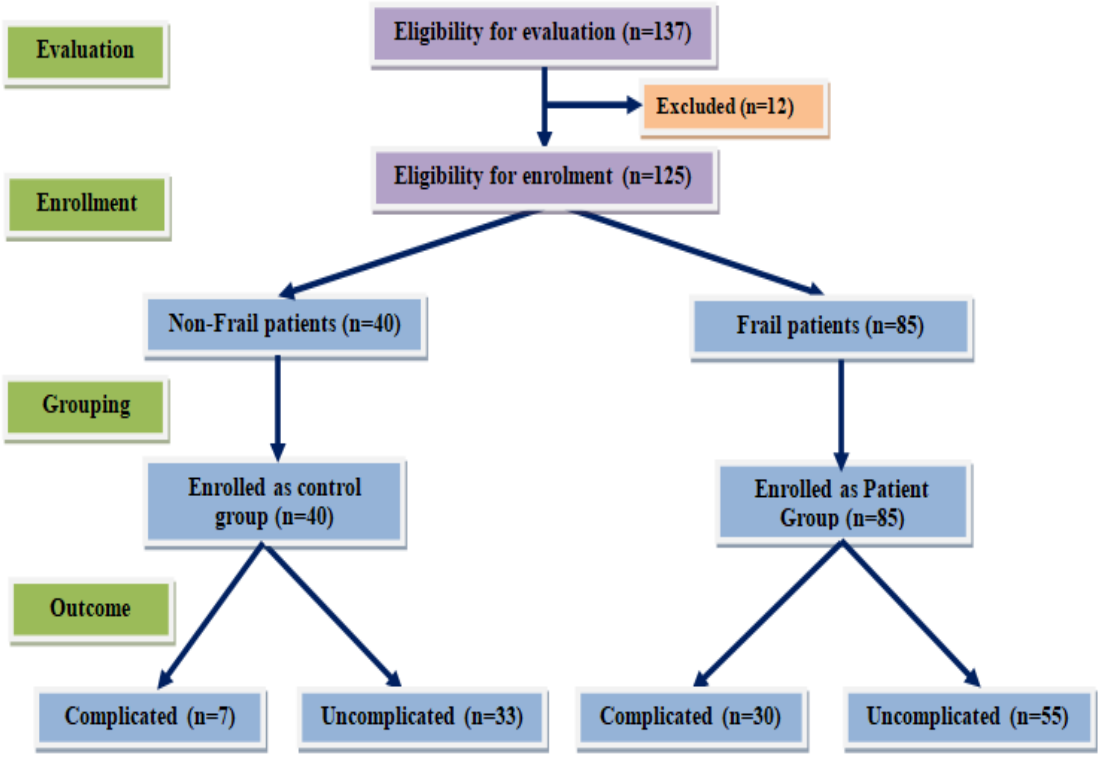

Fig.1. Study flowchart

The determined data at time of enrolment of patients of both groups showed insignificant difference between patients of both groups as shown in (**Table.1**).

Table 1. Enrolment data of patients of both groups

Item	Group	Non-Frail (n=40)	Frail (n=85)	P
Age (years)		66.5±4.7	68±4.9	0.105
Gender	**Males**	22 (55%)	33 (38.8%)	0.089
	Females	18 (45%)	52 (61.2%)	
BMI	**Overweight**	18 (45%)	26 (30.6%)	0.116
	Obese	22 (55%)	59 (69.4%)	
	Mean (±SD)	30.3±2.7	31±2.1	0.117
Surgical procedures	**Gastrectomy**	5 (12.5%)	9 (10.6%)	0.947
	Cholecystectomy	9 (22.5%)	22 (25.9%)	
	Choledicojejunostomy	6 (15%)	10 (11.8%)	
	Exploration of CBD	5 (12.5%)	12 (14.1%)	
	Anterior resection Cancer rectum	5 (12.5%)	9 (10.6%)	
	Whipples' procedure	2 (5%)	4 (4.7%)	
	Total colectomy for IBD	4 (10%)	7 (8.2%)	
	Hiatus hernia	2 (5%)	5 (5.9%)	
	Huge incisional hernia	2 (5%)	7 (8.2%)	

According to the calculated SAS, 65% of non-frail patients had SAS ≥7, while 77.6% of frail patients had SAS ≤6 with significantly (P=0.0001) higher distribution of frail patients among low SAS grades (**Fig. 2**). Similarly, the mean value of SAS

was significantly (P<0.001) lower in frail than non-frail patients (**Table.2**).

Table 2. Patients' distribution according to intraoperative assessment data for calculation of the Surgical Apgar Score

Item Group		Non-Frail (n=40)	Frail (n=85)	P
Patients' distribution according SAS	SAS=3	2 (5%)	15 (17.6%)	0.0001
	SAS=4	3 (7.5%)	20 (23.5%)	
	SAS=5	3 (7.5%)	18 (21.2%)	
	SAS=6	6 (15%)	13 (15.3%)	
	SAS=7	11 (27.5%)	12 (14.1%)	
	SAS=8	9 (22.5%)	6 (7.1%)	
	SAS=9	6 (15%)	1 (1.2%)	
Mean SAS (±SD)		6.8±1.7	5.1±1.6	<0.001

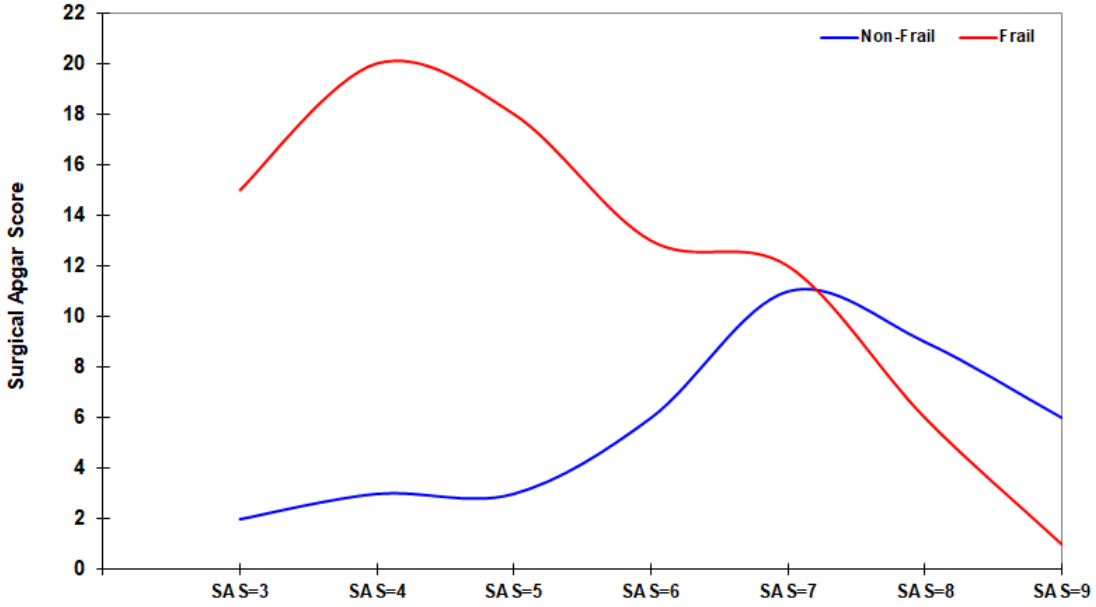

Fig.2. Distribution of patients of both groups according to the reported Surgical Apgar Score

During 30-d PO, 37 patients (29.6%) developed complications; 7 of non-frail (17.5%) and 30 of frail patients (35.3%) with significantly (P=0.042) higher complications rate among frail patients. Seventeen of complicated patients (45.9%) had grade-3 complications according to Clavien-Dindo classification and underwent second-look surgery; 3 non-frail and 14 frail patients with insignificant (P=0.855) difference between both groups. Nine of complicated patients (24.3%) developed grade-4 complications; one non-frail and 8 frail patients with insignificant difference (P=0.492) between frail and non-frail patients. These nine patients were admitted to surgical ICU; 6 frail patients and 2 frail had single organ dysfunction and one non-frail patient were admitted to surgical ICU for multi-organ dysfunction. Eleven of complicated patients developed either grade-1 or grade-2 complications with insignificant differences (P=0.078) between patients of both groups. Also, collectively patients' distribution according to the grades of Clavien-Dindo grade of complications showed non-significant (P=0.396) difference

between frail and non-frail patients (**Table.3**). Unfortunately, six patients died; one non-frail and 5 frail patients with insignificantly (P=0.409) higher mortality rate among frail patients.

Table 3. The frequency of Clavien-Dindo complications encountered in patients of both groups

Item / Group			Non-Frail (n=40)	Frail (n=85)	P
Frequency of complications	**Yes**		7 (17.5%)	30 (35.3%)	0.042
	No		33 (82.5%)	55 (64.7%)	
Patients' distribution according Clavien-Dindo grades	**Grade 1**		1 (2.5%)	3 (3.5%)	0.396
	Grade 2		2 (5%)	5 (7.1%)	
	Grade 3	**3a**	1 (2.5%)	5 (4.6%)	
		3b	2 (5%)	9 (10.6%)	
	Grade 4	**4a**	0	6 (7.1%)	
		4b	1 (2.5%)	2 (2.4%)	

The calculated SAS showed negative significant (P<0.001) correlation with the preoperative 11-mFI and 5-mFI scores (r=-0.412 & -0.451, respectively). Moreover, the frequency and severity of the 30-d complications showed significant positive relation to old age, female gender, and high BMI, and frailty scores on both indices, while showed negative significant correlation with the calculated IO SAS. Also, the reported mortality rate was positively related to old age and high scores on both indices, while showed negative relation to SAS (**Table.4**).

Table 4. The relation between the 30-day complication frequency and severity and mortality rate and patients' preoperative data and intraoperative SAS

Dependent variates / Independent variates	Frequency of complications		Severity of complications according to Clavien-Dindo grades		Mortality rate	
	"r"	P	"r"	P	"r"	P
Old age	0.317	<0.001	0.273	0.002	0.194	0.030
Female gender	0.186	0.037	0.176	0.049	0.108	0.359
High BMI	0.238	0.007	0.250	0.005	0.158	0.093
SAS	-0.492	<0.001	-0.440	<0.001	-0.271	0.002
11-Mfi	0.288	0.001	0.357	<0.001	0.252	0.005
5-mFI	0.363	<0.001	0.399	<0.001	0.293	0.001

ROC curve analysis of the variates correlated with the frequency of complications as predictors for the possibility of getting complications excluded patients' gender, while defined low SAS and high 5-FI score as the highly significant (P<0.001) predictors, while old age and high 11-mFI were significant (P=0.002 & 0.005, respectively) predictors (**Fig. 3**). Verification of these variates using the Multivariate Regression analysis defined low SAS as the persistently significant (P<0.001) predictor of getting complications in three models, old age as significant predictor in two models (P=0.003 in model 1 and 0.002 in model 2), while was excluded in

model 3. High 5-mFI score was defined as positive significant predictor in only model-1, but was excluded in other models. For prediction of complication of ≥3 on Clavien-Dindo classification, the ROC curve defined high scores on the 5-mFI and 11-mFI as significant (P=0.005 & 0.007, respectively), while low SAS and high BMI as weakly significant (P=0.014 & 0.043, respectively) predictors (**Fig. 4**). On contrary, Multivariate Regression analysis defined low SAS in three models, old age in two models and high 5-mFI score in one model as predictors for complications of grade ≥3 (**Table.5**).

Table 5. Predictors of the oncoming 30-day complication as frequency and severity

Analyses Variates	Receiver Operating Characteristic curve				Multivariate Regression analysis			
	AUC	Std.	P	95% CI	Model No.	Variate	β	P
The predictors for the frequency of oncoming 30-d complications								
Old age	0.679	0.055	0.002	0.571-0.786	1	SAS	-0.376	<0.001
Female gender	0.601	0.055	0.074	0.494-0.708		Age	0.232	0.003
High BMI	0.636	0.051	0.016	0.535-0.737		5-mFI	0.168	0.048
SAS	0.189	0.042	<0.001	0.107-0.272	2	SAS	-0.450	<0.001
11-mFI	0.658	0.055	0.005	0.551-0.765		Age	0.238	0.002
5-mFI	0.709	0.053	<0.001	0.604-0.813	3	SAS	-0.492	<0.001
The predictors for the severity of oncoming 30-d complications								
Old age	0.583	0.080	0.272	0.426-0.740	1	SAS	-0.297	0.001
Female gender	0.550	0.074	0.505	0.405-0.696		5-mFI	0.243	0.006
High BMI	0.653	0.067	0.043	0.522-0.785		Age	0.194	0.015
SAS	0.314	0.055	0.014	0.207-0.412	2	SAS	-0.327	<0.001
11-mFI	0.703	0.066	0.007	0.573-0.833		5-mFI	0.251	0.005
5-mFI	0.714	0.075	0.005	0.567-0.861	3	SAS	-0.440	<0.001

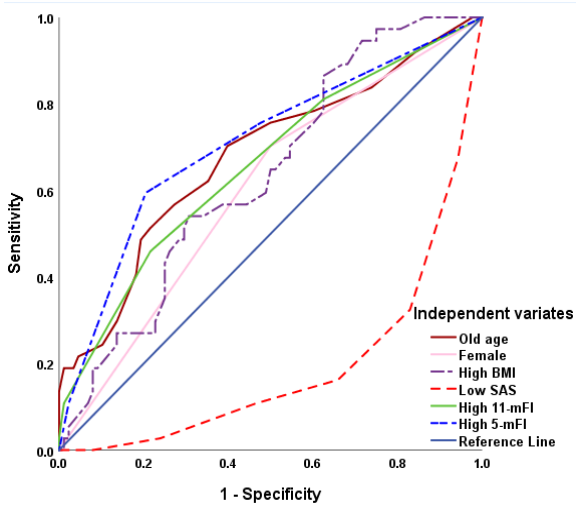

Fig. 3. ROC for the predictors of the oncoming 30-day complications

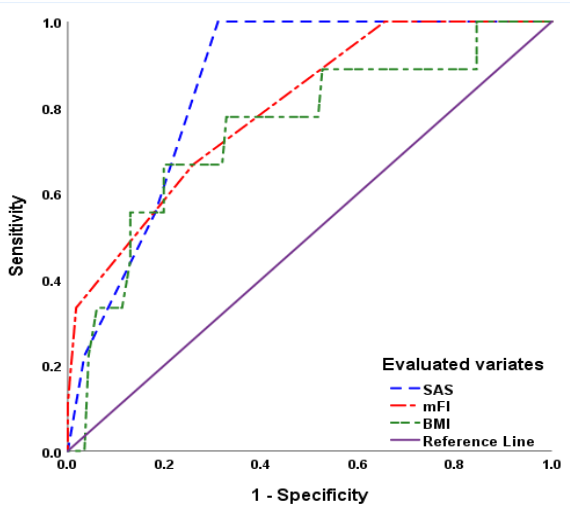

Fig. 4. ROC for the predictors of the oncoming 30-day complications ≥3 on Clavien-Dindo classification

The ROC curve analysis for preoperative data defined high preoperative 5-mFI and 11-mFI scores as the only significant (P=0.006 & 0.012, respectively) early predictors of SAS≤4 (**Fig. 5**). ROC curve analysis defined low SAS as the most significant (P=0.002) predictor for mortality, and high scores on the 5-mFI and 11-mFI as significant (P=0.010 & 0.019, respectively), while excluded patients' age, gender and BMI as predictors (**Table.6, Fig.6**). However, Multivariate Regression analysis defined high preoperative score on 5-mFI was the only significant (P=0.001) predictor for mortality with β-value of 0.293.

Table 6. ROC curve analysis for the early predictors for getting intraoperative SAS ≤4 and mortality during the 30-day follow-up after MAS

Variables	SAS≤4				Mortality			
	AUC	Std.	P	95% CI	AUC	Std.	P	95% CI
Old age	0.520	0.069	0.769	0.384-0.655	0.698	0.123	0.102	0.457-0.939
Female gender	0.530	0.066	0.656	0.400-0.660	0.556	0.118	0.644	0.325-0.787
High BMI	0.556	0.068	0.400	0.423-0.689	0.589	0.104	0.463	0.385-0.792
11-mFI	0.669	0.061	0.012	0.549-0.789	0.784	0.120	0.019	0.549-1.000
5-mFI	0.682	0.061	0.006	0.563-0.801	0.812	0.115	0.010	0.586-1.000
SAS					0.130	0.042	0.002	0.048-0.212

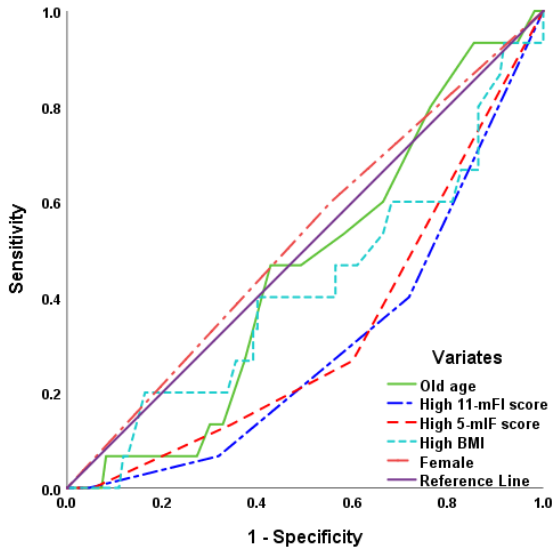

Fig. 5. ROC for the predictors of intraoperative SAS ≤4

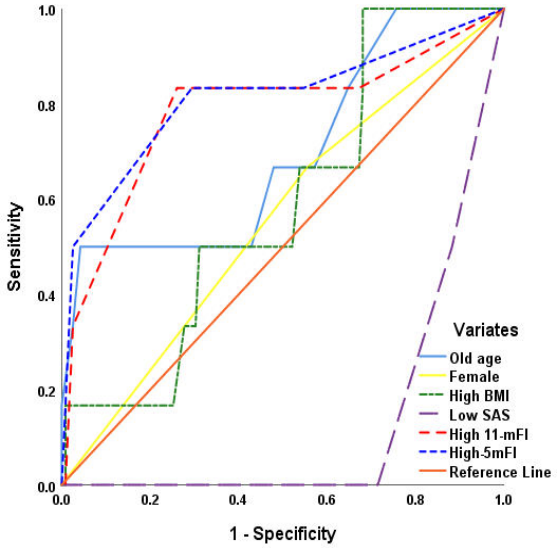

Fig. 6. ROC for the early predictors the 30-d mortality rate

Discussion

During the 30-d follow-up for 125 patients who aged ≥60 years and underwent MAS, 37 patients (29.6%) developed complications and six of them died for a 30-d mortality rate of 4.8%. These figures coincided with **Shimada et al., (2018)** who reported complication rates of 19.4% and 18.8% in patients had laparoscopic gastrectomy for cancer stomach and were aged >74 and <74 years, respectively. Also, **Quero et al., (2022)** reported a 30-day complication rate of 23.7% with longer PO hospital stay in elderly patients had surgery for adhesive small bowel obstruction and **Drews et al., (2022)** detected a complication rate of 17.3% among elderly patients underwent laparoscopic surgery for colorectal cancer. Thereafter, **Canac et al., (2023)** reported a 30-day mortality rate of 4% among elderly patients undergoing MAS.

Preoperative evaluation of frailty detected 85 (68%) and 70 (56%) frail patients according to scoring of the items of the 11-mFI and 5-mFI, respectively. This finding spotlight on the high frequency of frailty with its subsequent significant reduction of body physiological reserve among aged patients assigned for MAS and indicates the necessity for frailty evaluation, irrespective of the FI used, preoperatively to safeguard against oncoming frailty-induced complications.

Moreover, the frequency and severity of the developed complications showed positive relation to the preoperative scores on frailty indices and negative relation to the intraoperative SAS. Additionally, the statistical analyses defined high preoperative scores on the 5-mFI and low SAS of ≤4 as predictors for the possibility of getting complications especially that of grade ≥3 on Clavien-Dindo classification and as early predictors for 30-d PO mortality.

These findings go in hand with **Kloos et al., (2023)** who documented that for patients undergoing urgent thoracic surgery increasing frailty was associated with a higher 90-day risk of mortality and suggested the implement of frailty evaluation as a valuable tool in both clinical settings and risk assessment. Recently, **Khajoueinejad et al., (2024)** detected a frailty rate of 72% among cancer patients planned to have curative-intent surgery and found

frail patients showed significantly higher 30-d readmission rate and increased PO mortality at 90 and 180 days than non-frail patients. Also, **Kohada et al., (2024)** categorized patients undergoing radical nephroureterectomy as 18.9% high and 81.1% low frail on the 5-mFI and reported significantly higher rates of severe surgical complications, ≥30 days of hospitalization, worse progression-free and overall survival among high frail patients and found the 5-mFI is a significant predictive indicator for these PO events. Moreover, **Ottaviano et al., (2024)** documented that high frailty score of ≥2 on mFI-5 was associated with greater morbidity, mortality, and elongated length of hospital stay after Hartmann's reversal, but found laparoscopic approach was better than open approach for reducing the frequency of PO and length of PO hospital stay. Further, **Talwar et al., (2024A)** found frail patients aged >60 years who underwent surgery for adhesive small bowel obstruction had significantly higher 30-d morbidity and need for higher level of care on discharge and found functional dependence, an item of the modified FI, was independently associated with worse 30-d overall morbidity and lower likelihood of returning to preoperative disposition. Also, **Talwar et al., (2024B)** in a national study for 5-years found frail patients had longer PO hospital stay, greater consumption of healthcare resources and showed higher incidence of in-hospital mortality, and concluded that the modified FI may predict PO outcomes for old patients undergoing surgery for adhesive small bowel obstruction. **Hung et al., (2024)** documented that pretreatment frailty was significantly associated with worse survival outcomes and more surgical complications in the older patients after elective MAS.

The calculated SAS for intraoperative events showed negative significant correlation with the scores of 5-mFI and the 30-d PO complication rate and was found to predict complications as regards the frequency and severity as judged by the Clavien-Dindo classification. In line with these findings, **Nair et al., (2018)** found patient with low SAS might develop adverse perioperative life-threatening events during 30-d PO and application of SAS might help to identify patients at risk, in need of monitoring and careful follow-up during the PO period. Thereafter, **Hino et al., (2023)** found lower SAS and lower percentage of vital capacity are independent negative risk factors for major complications after surgical management of lung cancer and found lower SAS might predict poor 5-year overall and cancer-specific survival rates. Additionally, **Kyaruzi et al., (2023)** found high-risk SAS patients with SAS ≤4 showed higher odds for getting severe and life-threatening complications than of low-risk patients with SAS ≥7 and ROC curve demonstrated good accuracy of SAS to predict PO complications. Recently, **Hirai et al. (2024)** documented that frail patients mostly have lower SAS and patients with lower SAS have higher PO complication rates and recommended evaluation of both frailty and SAS for patients who underwent cancer surgery as predictors for outcomes.

Limitation: Restriction of frailty assessment of the 11-mFI and 5-mFI is a limitation of the current study because of the presence of other frailty indices that may be more appropriate for surgical patients.

Recommendation: A trial of preoperative rehabilitation and adjustment of items evaluated for

frailty scoring might improve the outcomes of frail patients planned to elective surgery. Further, assessment of the nutritional deficiencies and its adjustment is another prerequisite to improve the outcomes of these patients

Conclusion

Frailty constitutes a real risk for patients older than 60 years planned for MAS and must be inquired for preoperatively to safeguard against the possibility of getting PO complications especially that ≥3 on Clavien-Dindo classification. SAS is an applicable IO risk score that might predict PO complications as regards frequency and severity. Low SAS is common among frail patients and both low SAS and high score on FIs might be used as early predictors for PO severe complications and mortality of patients undergoing MAS.

Author contributions: The collection of the preoperative and operative data was the duty of Dabour YS, the postoperative data was collected by Allam TM and the interpretation of these data was performed by Shehab HA. The authors were not responsible for anesthetic procedure for any case.

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