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Is age an independent risk factor for mortality in elderly patients undergoing elective abdominal surgery?

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Abstract

Introduction: *The improvement in health care sector and advancement in medicine has made the elderly patients eligible to undergo procedures previously thought to be unsafe. Age has been thought to affect post- operative outcomes in the elderly therefore it needs to be studied whether it has any prognostic significance in this age group.*

Objective: *This study aims to compare 30-day mortality between patients older than 60 years undergoing elective abdominal surgery with those younger than 60 years of age and identify whether age is an independent factor affecting mortality in surgical patients.*

Material and Methods: *This study was prospective cohort in type, conducted at Aga Khan University Hospital Karachi, over a six-month period between 1st November 2013 to 30th April 2014. It included all adult patients undergoing elective abdominal surgeries. Two cohorts consisted adults less than 60 years and those aged 60 and above. Both were compared in terms of morbidity and Mortality after undergoing surgery. SPSS 19 was used for statistical Analysis and p value of < 0.05 was considered statistically significant. Multivariate Logistic Regression analysis was done on variables found to be significant on Univariate analysis and it was found that type of surgery and preoperative creatinine levels were significant predictors of post- operative mortality in the elderly.*

Results: *There were 326 patients who underwent elective abdominal surgery during the study period. One group consisted of age less than 60 years with 172 patients and another group consisted of age more than 60 years with 154 patients. There were 146 males (44%) and 180 females (56%). Mean age was around 48 years ± standard deviation 15 years. Univariate analysis and Multivariate analysis was performed, and preoperative creatinine was identified as a significant factor influencing mortality in the elderly whereas preoperative hemoglobin had an association with morbidity in the elderly.*

Conclusion: *The elderly aged 60 and above seem to exhibit more morbidity and higher mortality when compared to the young however when subjected to regression analysis age is not an independent predictor of morbidity and mortality. Pre-operative creatinine levels seem to be influencing the higher mortality in the elderly and preoperative haemoglobin levels seem to be correlating with the higher morbidity seen in the elderly patients.*

Keywords: mortality, morbidity, elective abdominal surgery, elderly

Introduction

The advancement in modern medicine and improvement in health care sector has led to a dynamic shift in demographics with more elderly patients gaining the possibility of surgical intervention [1]. Elderly patients have a high incidence of co-morbidities with poorer functional status and an increased likelihood to present as an emergency with advanced disease; hence, they should be studied separately [2].

Old age remains a high risk for both morbidity and mortality, despite there being major advancements in both surgery and anesthesia over the past five decades resulting in improved peri-operative mortality in all surgical sub specialties across all ages [3-5]. The reduced physiological reserve coupled with co-morbidities reduces the ability of older individuals to respond to stress of acute illness and surgery. The elderly present with unique health care challenges owing to their special physiologic, pharmacologic, psychologic and sociologic attributes that are not present in the young [6]. The role of multidisciplinary teams, including anesthetists, geriatricians, physicians and surgeons working together can have a significant impact in improving outcomes. Measures such as preoperative risk assessment specifically designed for the elderly with emphasis on optimization of co-morbidities, improved theatre access, better intra-operative monitoring and planned postoperative care can remarkably lower morbidity and mortality [7]. Surgeons as medical experts need to decide whether surgical treatment is justified in these patients owing to the greater risks involved and unpredictable benefits [8].

The impact of age on in hospital mortality and capacity planning remains to be uncertain [9]. Some studies have found age to be an independent risk factor for the mortality and morbidity for geriatric patients with mortality rates ranging from 6% to7.5% [9-11]. On the contrary, evidence is emerging suggesting that age as a cardinality of years holds no significance, and that the correlations lends itself to “physiological age” [12]. The hypothesis arose after Greenburg and colleagues excluded confounding comorbidities, revealing age to not be a risk factor [13].

A controversy hence exists whether age can be accurately utilized to predict mortality following surgery in the elderly.

Rationale

The data on the independent effect of age on post-operative mortality is scarce pertaining to the geriatric population. With the bulk of this work being done in the West, there exists a regional deficiency in the literature as no such studies have been conducted in Pakistan to date. Given the difference of genetic and environmental factors that affect aging, there are potential differences in co-morbidities and disease patterns that could ultimately affect the post-operative prognosis of geriatric subjects of surgery. This study aims to compare 30-day mortality between patients older than 60 years undergoing elective abdominal surgery with those younger than 60 years of age and identify whether age is an independent factor affecting mortality in surgical patients.

Methodology

The study was a prospective cohort type and was conducted at the Aga Khan University Hospital between 1st November 2013 and 30th April 2014. The study sample were adults undergoing abdominal surgeries in the specified time limit and were defined as elderly at the age of at least years. Sample size was collected using the WHO Sample Size collector software and concluded the need for a sample size of 144 to achieve 80% power and 5% level of significance.

All consenting patients had their data entered on a paper Performa then onto SPSSv19 for analysis. Patients were followed up for the next 30 days as weekly follow ups in clinic. Absence from clinic appointments were contacted via telephone. Deaths in the first 30 postoperative day were recorded as mortality.

Results

There were 326 patients who underwent elective abdominal surgery included in our study from 1st November 2013 to 30th April 2014 over a six-month period. These were categorized in to two sub groups. One group, consisting of age less than 60 years with 172 patients and another group consisting of age more than 60 years with 154 patients. There were 146 males (44%) and 180 females (56%). Mean age was around 48 years ± standard deviation 15 years. Mean Preoperative Cr was around 0.7 ± SD 0.2 in age group < 60 years. The mean pre- operative Cr was 0.81 ± 0.31 in the elderly group > 60 years of age. The mean preoperative Hb was around 12.65` ± SD 2 in the young while 12.47 ± 1.68 in the elderly group. The average length of stay was around 4.52days ± 7 days in the young compared to 5.34 ± 9 days in the elderly. The mean operative time was 172 ± 199 minutes in the young age group in comparison to elderly group aged 60 and above in which it was around 183.77 ± 214.29 minutes. The length of stay, preoperative Hb and Operative time were not statistically significant. The Pre-operative Cr was one of the continuous variables which reached statistical significance with a p value of 0.05. The above continuous variables were analyzed by Independent sample T Test. Most of the surgeries performed were clean contaminated representing around (n=216) 66% cases followed by clean surgeries in (n=91) 28 %, 4 % (n=12) dirty and (n=3)0.9% contaminated. There was in total 2.8% (n=9) mortality seen in our elective abdominal cases.

Univariate analysis of qualitative variables

In our study there was one death in the age group below 60 years while eight deaths in the elderly above 60 years of age, this represented 0.6% versus 5.2% mortality respectively between the two groups. This difference in the mortality percentage between the two groups was statistically significant (p=0.015) when fisher exact test was applied. The risk of dying was 9.3 times higher in the elderly age 60 and above then the young. Thirteen percent morbidity was seen in our population (n=42) most of which was attributable to the elderly population aged 60 and above (n=23, 15%). The age group below 60 years showed 11% morbidity (n=19). When compared the elderly showed a higher morbidity trend as compared to the young but this was not statistically significant p= 0.326. The risk of morbidity in the elderly was estimated to be around 1.4 times more than the young age below 60 years of age. When the effect of type of surgery on morbidity and mortality was studied; a higher morbidity and mortality was seen in the elderly aged 60 and above who had undergone dirty category surgery with 33% (n=4) and 25% (n=3) morbidity and mortality respectively. The mortality trend was statistically significant though morbidity trend did not achieve significance with p value around 0.14 and 0.00 respectively. This showed that the elderly who underwent dirty surgeries were at an increased risk of dying than their counterparts of similar age and this risk was decreased in the young age group below 60 years as well. The Elderly who had accompanying comorbid conditions when compared with those with no comorbid did not show an increased mortality trend (n=8, 6%) compared to (n=1, 0.5%) mortality in those below sixty years of age. This was statistically significant (p=0.012) and showed that the elderly had a 10.8 time more risk of dying if they had associated comorbid conditions. When comparisons were made keeping morbidity in aspect, the elderly population above 60 years showed an increasing trend towards morbidity with 17.5% (n=25) developing complications compared to 9.3% (n=17) in the young aged 60 and below. In total this represented around 13% overall morbidity rate when comorbities were taken in to consideration and this was statistically significant (p=0.031) with a relative risk of 2.06. Thus, the elderly in our population exhibited increased tendency for both morbidity and mortality when they had an associated comorbid condition present. When functional class of the patients was taken in to context and morbidity and mortality trends observed; it was seen that there was an increased tendency towards developing complications as the functional class deteriorated however this was not statistically significant in both morbidity and mortality category. There was comparable morbidity and mortality when gender was taken into consideration and this was not statistically significant.

Univariate analysis of quantitative variables

Univariate analysis was performed on quantitative variables like preoperative creatinine, preoperative haemoglobin, length of stay, and Operative time considering them to be factors influencing both morbidity and mortality in the elderly. We found that length of stay, preoperative haemoglobin, operative time and length of stay were not significant for mortality in our Univariate Regression Analysis however preoperative creatinine levels were found to be statistically significant with an odds ratio of 12.72 and p value of 0.005. This showed that the preoperative creatinine levels had a direct effect on the mortality in the elderly. When the same variables were subjected to univariate regression analysis in order to assess their association with morbidity; length of stay, preoperative creatinine

Independent factors affecting mortality													
	Age		Gender		Functional Class			Comorbidity		Types of surgery			
	<60	≥60	Male	Female	I	II	III	Present	Not present	Clean	Clean/ contaminated	Contaminated	Dirty
	1 (0.6%)	8 (5.2%)	6 (4.1%)	3 (1.7%)	3 (11%)	3 (11%)	3 (7%)	1 (0.5%)	8 (5.6%)	4 (4.4%)	2 (0.9%)	0 (0%)	3 (25%)
	9 (2.8%)		9 (2.8%)		9 (3%)			9 (2.8%)		9 (2.8%)			
Relative Risk	9.3		0.4		-			10.8		-			
P value	0.015		0.31		0.192			0.012		0			

Table 1. *Independent factors affecting mortality*

levels and operative time were not statistically significant factor however the preoperative haemoglobin levels were found to be a significant factor influencing morbidity in the elderly with an odds ratio of 0.81 and p value of around 0.032. This showed that preoperative anaemia is a significant factor influencing morbidity in the elderly.

Multivariate regression analysis on significant qualitative and quantitative variables

Multivariate Logistic Regression analysis was done on variables found to be significant on Univariate analysis and it was found that type of surgery and preoperative creatinine levels were significant predictors of post- operative mortality in the elderly. Preoperative Haemoglobin levels were significant predictor for morbidity in the elderly after excluding all other confounding variables revealed statistical significance in length of stay (p=0.038) (Table 1).

Discussion

As the population continues to grow more elderly patients are presenting for surgical conditions and are offered treatment, when previously, it was not considered an option. The elderly seems to be a delicate stratum of population which demands more care and attention compared to the young. We aimed at predicting whether age has an independent effect on morbidity and mortality as strongly recommend surgical intervention is difficult in these patients, even in the face of a clear-cut indication. Accurate information regarding the risks and benefits of surgical intervention in the elderly is required to help surgeons provide prognostic information to both patients and their families.

The mortality in our population was around 2.8%; with 0.6% mortality seen in patients who were less than 60 years of age and 5.2% in those above 60 years. These mortality rates to the literature in which 6 to 17.4% have been reported for various categories of surgery in the geriatric demographic [8-10]. There are also studies that concur with our conclusion that serum creatinine influences mortality [8,14,15].

Preoperative creatinine levels were found to be a significant predictor of mortality in the elderly. We did not see any effect of preoperative hemoglobin on mortality of elderly patients, however, it did have a statistically significant influence on morbidity.

The strengths of our study were that it was a prospective study and covered a very important and scarcely studied topic. As the population ages there is increased need to study the elderly population, recognize their needs and identify the factors which when modified can be used to improve their health as a whole. Most of the studies done on the elderly are from western populations and there is a dire need to study the Asian population in this respect.

Weaknesses in our study include the fact that we do not have information on elderly with surgical problems who were not offered surgery. We have no way of knowing how many elderly patients may have been seen in clinics that were either refused surgery or had declined elective procedures. Also, the weak points were that it covered almost all abdominal surgeries; both laparoscopic and open procedures were taken in to consideration which makes it more diverse. Analyzing and comparing the results has been difficult, as there were different surgical procedures and indications grouped together. Our analysis was restricted to elective abdominal surgery in this elderly group, and we were able to document specific morbidity and mortality for specific diagnoses and operations.

Conclusion

We found that the surgical risks were substantial, complications were frequent, and the vast majority of patients were incapable of independent living after discharge from hospital. The elderly aged 60 and above seem to exhibit more morbidity and higher mortality when compared to the young in our study population however this when subjected to regression analysis was not found to be independent predictor of morbidity and mortality. Pre-operative creatinine levels seem to be influencing the higher mortality in the elderly and preoperative hemoglobin levels seem to be correlating with the higher morbidity seen in the elderly patients.

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