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Research Article

Factors Associated with Postoperative Mortality in the General Surgery Department of Ignace Deen Hospital of Conakry University Hospital

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Abstract

Introduction: The aim of this study was to analyze the prevalence and factors associated with Postoperative Mortality (POM) in the general surgery department of the Ignace Deen hospital of the Conakry University Hospital.

Material and methods: This was a Four-month prospective cohort (September to December 2018) conducted in the general surgery department of the Ignace Deen hospital of the Conakry University Hospital. The patients were divided into groups of "deceased" and "alive" postoperatively. The qualitative and quantitative variables were compared in these two groups. The univariate logistic regression then the multivariate one was carried out.

Results: a series of 399 operated on was included in the analysis. The median age was 26 years (P25=18; p75=42). The prevalence of postoperative mortality was 3.5% (95% CI : 1.8 - 5.5) .

multivariate analysis by logistic regression, two factors associated with postoperative mortality were identified: advanced age ≥ 60 years (OR: 9.8; CI: 2.5 - 37.7) and resection of small bowel loops (OR: 8.3; CI: 1.3 - 52.4).

Conclusion : The analysis of mortality factors in this study allowed us to note a high risk of postoperative mortality in patients of advanced age and in those in whom a small intestinal resection had been performed.

Improving the surgical prognosis will require the identification of mortality factors and their adequate management.

Keywords: Associated factors; Ignace Deen; Postoperative mortality

Introduction

Postoperative mortality is a major adverse event that occurs after surgery. This is the ultimate postoperative complication. It is feared by all surgical teams [1]. It depends on the complex interaction between different factors relating to the patient's condition, anesthesia and surgery as well as the postoperative course [2]. Analysis of the factors associated with this mortality was necessary to improve the overall management and quality of care for surgical patients [2,3]. The objective of the study was to study the prevalence and factors associated with postoperative mortality in the general surgery department of the Ignace Deen-CHU hospital in Conakry.

Methodology

This was a 4-month prospective cohort study from September 1 to December 31, 2018, carried out in the General Surgery department of the Ignace Deen Hospital of the Conakry University Hospital. Abdominal surgery patients in the department during the study period were included. The variables were postoperative death (predicted variable, considered as the occurrence of death in an operated patient during the first 30 postoperative days), characteristics relating to the patient's condition, anesthesia and surgery, as well as postoperative course. The data was collected on a survey form. It was informed by observation of surgical interventions, evaluation of patients postoperatively, supplemented by questioning of patients and accompanying persons, review of medical files and registers of operating protocols. The data were analyzed using SPSS software (Statistical Package for the Social Sciences) version 21.0. The prevalence of MPO and its 95% confidence interval were determined. For the descriptive statistics, the continuous variables were presented in median with interquartile range, while the qualitative variables were expressed in proportion (percentages). To investigate the statistical relationship between the different factors and postoperative mortality, we first compared the two subgroups (deceased and alive) using the Chi 2 test or the Fisher exact test when the theoretical number was lower. to 5. Then, a univariate analysis by logistic regression was carried out, in order to determine the possible link of mortality with each factor studied. Finally, multivariate logistic regression analysis was used to analyze factors associated with postoperative mortality. Only variables with a p-value ≥ 20% in univariate analysis were selected in the multivariate regression model. The statistical significance threshold was chosen at p=0.05. If the p value>0.05, the relationship would be due to chance, therefore statistically not significant, and if p<0.05, the relationship would not be due to chance, therefore statistically significant.

Results

Presentation of the general population

From September 1 to December 31, 2018, four hundred (400) patients operated on in the department took part in the study. Among them, one case of out-of-hospital death was excluded and 399 were included in the analysis. The female gender was predominant with 53.9% (n=215) of cases. Patient ages ranged from less than 1 year to 88 years. The median age was 26 years (P25=18; p75=42). Postoperative complications were observed in 10.5% of cases. We recorded 3.5% (n=14; 95% CI [1.8 - 5.5]) deaths.

Description of patients who died postoperatively (n=14)

All the pre-perioperative and postoperative characteristics of the deceased patients are presented in Tables 1-4.

Features	Effective	Percentage
Sex		
- **Male**	**10**	**71.4**
- Feminine	4	28.6
Age (years)		
- <30	5	35.8
- 40-49	1	7.1
- **≥60**	**8**	**57.1**
Median: 61.5 (P25=18; p75=72.5)		
Comorbidities		
- **hypertension**	**2**	**14.3**
- **Diabetes**	**2**	**14.3**
- Asthma	1	7.1
Vices		
- **Tobacco**	**4**	**66.7**
- Alcohol	2	33.3

Table 1: Description of the characteristics relating to the initial condition of patients who died postoperatively in the general surgery department of the Ignace Deen hospital of the Conakry University Hospital, from September to December 2018 (n=14).

Features	Workforce	Percentages
Pre-anesthetic consultation		
- Performed	3	21.4
- **Not carried out**	**11**	**78.6**
Qualification level of the anesthetist		
- Specialist	2	14.3
- **State nurse acting as an anesthetist**	**12**	**85.7**
ASA score		
- III	2	14.3
- **Not evaluated**	**12**	**85.7**
Type of anesthesia		
- **General anaesthesia**	**13**	**92.9**
- Locoregional anesthesia	1	7.1
type of surgery		
- **Emergency**	**10**	**71.4**
- Planned	4	28.6
Surgical treatment time (hours)		
- **≤ 24**	**8**	**57.1**
- 25-72	2	14.2
- > 72	4	28.7
Surgical pathology		
- **Acute generalized peritonitis**	**4**	**28.6**
- **Abdominal tumor***	**3**	**21.4**
- **Dolichocolon**	**2**	**14.3**
- Others	5	35.7
Operative gesture		
- **Toileting the abdominal cavity**	**4**	**14.8**
- **Anastomosis resection of small bowel loops**	**3**	**11.1**
- **Hemi colectomy**	**3**	**11.1**
- Gap excision-suture	2	7.4
- Appendectomy	2	7.4
- Cholecystectomy	2	7.4
- Flange resection	2	7.4

- Necrosectomy	2	7.4
- Others	7	25.9
Duration of intervention (hours)		
- **≥4**	**1**	**7.1**
- **2-3**	**6**	**42.9**
- 1-2	5	35.7
- 0-1	2	14.3
Operator qualification level		
- **Specialist**	**13**	**92.9**
- Doctor in DES	1	7.1

*: Tumor of the head of the pancreas; Cecal tumor; Peritoneal carcinoma.

Table 2: Description of characteristics relating to anesthesia and surgery of patients who died postoperatively in the general surgery department of the Ignace Deen hospital of the Conakry University Hospital, from September to December 2018 (n=14).

Features	Workforce	Percentages
Type of postoperative complication		
- Postoperative sepsis	**7**	**33.3**
- Postoperative digestive fistula	3	14.3
- Surgical site infection	3	14.3
- Postoperative peritonitis	3	14.3
- Postoperative hemorrhage	2	9.5
- Bedsores	3	14.3
ECB of pus		
- **Not done**	**3**	**100.0**
Antibiotic therapy		
- **Probabilistic**	**14**	**100.0**
Surgical revision		
- **Yes**	**2**	**14.3**
- No	12	85.7

Table 3: Description of the characteristics relating to the postoperative evolution of patients who died in the general surgery department of the Ignace Deen hospital of the University Hospital of Conakry, from September to December 2018 (n=14).

Features	Workforce	Percentages
Time to death (days)		
- **0-10**	**6**	**42.9**
- **11-20**	**7**	**50.0**
- 21-30	1	7.1
Table of deaths		
- **Septic shock**	**8**	**57.1**
- Hypovolemic shock	4	28.6
- Respiratory distress	2	14.3
Days of death		
- **Monday to Friday**	**12**	**85.7**
- Saturday and Sunday	2	14.3
Nycthemera of death		
- 08-16	1	7.1
- **16-08**	**13**	**92.9**

Table 4: Description of characteristics relating to postoperative deaths of patients in the general surgery department of the Ignace Deen hospital of the Conakry University Hospital, from September to December 2018 (n=14).

Comparison of "Deceased" versus "Survivors" subgroups

The comparison between the subgroup of survivors versus the subgroup of deceased in terms of the different parameters is presented in Table 5.

Variables	Group Deceased	Group Survivors	P value
	n=14	n=385	
	not (%)	**not (%)**	
Sex			
Male	10 (71.4)	174 (45.2)	0.053
Feminine	4 (28.6)	211 (54.8)	
Age (years)			
≥60	8 (57.1)	30 (7.8)	**0**
<60	6 (42.9)	355 (92.2)	
Diabetes	2 (14.3)	0 (00.0)	**0.001**
hypertension	2 (14.3)	4 (1.0)	**0.016**
Tobacco	4 (28.6)	38 (9.9)	**0.049**
Alcohol	2 (14.3)	26 (6.8)	0.257
Pre-anesthetic consultation			
Not carried out	11 (78.6)	351 (91.2)	0.131
Performed	3 (21.4)	34 (8.8)	
Qualification of the anesthetist			
State nurse	12 (85.7)	375 (97.4)	0.062
Specialist	2 (14.3)	10 (2.6)	

ASA score (n=8)			
≥III	2 (100)	0 (00.0)	**0.036**
<III	0 (00.0)	6 (100)	
Type of anesthesia			
General anaesthesia	13 (92.9)	333 (86.5)	0.704
Locoregional anesthesia	1 (7.1)	52 (13.5)	
Emergency surgery	10 (71.4)	249 (64.7)	0.778
Surgical PEC time (hours)			
≤ 24	14 (100)	382 (99.2)	0.947
> 24	0 (00.0)	2 (0.8)	
Acute generalized peritonitis	4 (28.6)	23 (6.0)	**0.01**
Abdominal tumor	3 (21.4)	23 (6.0)	0.055
Dolichocolon	2 (14.3)	15 (3.9)	0.115
Toileting the abdominal cavity	4 (28.6)	29 (7.5)	**0.022**
Resection of small bowel loops	4 (28.6)	23 (6.0)	**0.01**
Hemicolectomy	3 (21.4)	29 (7.5)	0.093
Duration of intervention (hours)			
≥2	7 (50.0)	43 (11.2)	**0.001**
<2	7 (50.0)	342 (88.8)	
Operator qualification			
Specialist	13 (92.9)	185 (48.1)	**0.001**
Doctor in DES	1 (7.1)	200 (51.9)	
Postoperative sepsis	7 (50.0)	1 (0.3)	**0**
ECB of pus			
not carried out	14 (100)	382 (99.2)	1,000
Carried out	0 (00)	3 (0.8)	
Probabilistic antibiotic therapy	14 (100)	23 (6.0)	0.539
Revision surgery			
Yes	2 (14.3)	4 (1.0)	1,000
No	12 (85.7)	381 (99.0)	

Table 5: Comparison of the different characteristics between the ‘’Deceased’’ (n=14) and ‘’Survivors’’ (n=385) subgroups postoperatively in the general surgery department of the Ignace Deen hospital of the University Hospital of Conakry, from September to December 2018 (N=399).

Univariate Analysis by Logistic Regression

In univariate analysis, age ≥ 60 years, arterial hypertension, smoking, generalized acute peritonitis, washing of the abdominal cavity, resection of small loops and a duration of intervention ≥ 2 hours demonstrated an association statistically significant with postoperative death in the general surgery department of the Ignace Deen hospital of the University Hospital of Conakry (Table 6).

Features		GOLD	95% CI	P value
Age (years)	≥60	15.7	5.1 - 48.4	0.000
	<60	Reference		
hypertension	Yes	15.8	2.6 - 95.2	0.002
	No	Reference		
Tobacco	Yes	3.6	1.0 - 12.2	0.035
	No	Reference		
Acute generalized peritonitis	Yes	6.0	1.7 - 20.6	0.004
	No	Reference		
Toileting the abdominal cavity	Yes	4.9	1.4 - 16.6	0.011
	No	Reference		
Resection of small bowel loops	Yes	20.7	4.3 - 97.8	0.000
	No	Reference		
Intervention duration (hours)	≥ 2	7.9	2.6 - 23.7	0.000
	< 2	Reference		

OR: Odds ratio; 95% CI: 95% confidence interval

Table 6: Univariate analysis by logistic regression of factors associated with postoperative mortality in the general surgery department of Ignace Deen Hospital of Conakry University Hospital, from September to December 2018 (N=399).

Multivariate Analysis by Logistic Regression

The 8 factors significantly associated with postoperative mortality in univariate analysis were included in a multivariate logistic regression model (Table 7).

Features		**GOLD**	**95% CI**	**P value**
Age	≥ 60 years old	9.8	2.5 - 37.7	0.001
	< 60 years	Reference		
Resection of small bowel loops	Yes	8.3	1.3 - 52.4	0.023
	No	Reference		

OR: Odds ratio; 95% CI: 95% confidence interval

Table 7: Multivariate analysis by logistic regression of factors associated with postoperative mortality in the general surgery department of the Ignace Deen hospital of the Conakry University Hospital, from September to December 2018 (N=399).

Discussion

The main difficulties in carrying out this study were the non-systematic evaluation of patients in pre-anesthetic consultation, the non-performance of ECB of the pus due to the high cost which was an additional burden in almost all surgical site infections and finally the poor collaboration of some patients as part of follow-up after discharge from hospital. However, we used as much information as we could gather to carry out this study. In our study, the prevalence of MPO was 3.5%. This prevalence is close to that of 4% found by Pearse et al . in 2012 in Europe [4]. On the other hand, it is significantly lower than that of 9.3% reported by Touré et al. in 2012 in the same department [5]. This difference could be explained by the improvement of the technical platform and the continuing training of the nursing staff which took place between our two studies. Advanced age is frequently described as a factor associated with POD. This was confirmed in our study, through multivariate analysis by logistic regression, where the age of 60 years and over which represented 57% of deaths had demonstrated a significant association with MPO and a risk multiplied by 10 (P = 0.001; OR=9.8; CI 2.5 - 37.7). Marzougui et al . found a similar result in 2014 in Tunis in a study of 102 patients with PPO, where age over 60 years was identified as an independent risk factor for mortality ($p < 0.001$) [6].

Other studies have reported that advanced age was a predictor of MPO from the age of 70 (Buisson et al. 2013, p=0.003 [7], Moorjani et al. 2013, p=0.519 OR=1.02 (0.97-1.07) [8], Alves et al., 2007, p=0.0001 [9]) We conclude in our study that age greater than or equal to 60 years is a factor associated with PDO . This could be explained by the fragility of the elderly linked to their background (age, underlying pathologies). Although taken into account among the comorbidities classified according to their degree of severity in the ASA score, arterial hypertension is less cited in its association with POD. In a single-center study published in 2013 focusing on early MPO factors in patients who underwent radical surgery for gastric carcinoma, Vural et al. (2013) [10] observed an absence of a statistically significant link between high blood pressure (hypertension) and POD. In our study, of the six hypertensive patients, 2 died, i.e. 14% of deaths. Hypertension was associated with MPO in the univariate analysis (p=0.002) but not in the multivariate analysis . Few authors that we consulted have evaluated the association of tobacco with the MPO. Eslami et al. in 2016 concluded that there was no statistically significant relationship between tobacco and MPO [11]. This corroborates our result which did not identify tobacco as a factor associated with MPO in multivariate analysis ; but it should be noted that in univariate analysis Tobacco demonstrated a significant association with MPO (p=0.035), which was also the case in the study by Afshar et Al. (p=0.04) [12].

Preparation for surgery is an important part of prognosis. A group of patients with so-called ‘’poor’’ surgical preparation had recorded 26.5% of deaths versus 11.5% of deaths in the group having benefited from so-called ‘’good’’ surgical preparation according to Elias et al. [13]. In this comparison, the association was statistically established between “poor” surgical preparation and MPO (p=0.001). The ASA score ≥ III has often been associated with significant mortality in different studies. In a multicenter retrospective trial conducted by Pearse et al. [4] about 46,539 cases of non-cardiac surgery, an ASA score ≥ III represented an independent risk factor for 30-day POD (p=0.0001) in multivariate analysis . In our study, the ASA score was evaluated in 8 out of 399 patients. , low knowledge of the tool by state nurses acting as anesthetists who were the majority (97.4%). The mortality rate was 100% in the 2 patients classified ASA ≥ III . The six (6) patients classified ASA< III were all alive. Univariate analysis found a significant association between an ASA score ≥ III and MPO (p=0.036). Emergency surgery is one of the most recurrent risk factors for POD in the literature. In multivariate analysis , emergency surgery was found to be an independent predictive factor of POD (with a risk sometimes multiplied by 7) according to the results of Glance et al. (p=0.001) [14], Sapra et al. (p=0.0005) [15], Elias et al. (p=0.001) [13], Slim et al. (p=0.000; OR: 4.3) [16], Alves et al. (p=0.0001; OR: 7.6) [9]. Of the patients in our study, 64.7% (249) were operated on for emergency surgical pathologies. The latter accounted for 71.4% of the deaths observed. The delay in consultation which would complicate the clinical picture of patients could explain this mortality rate from surgical emergencies. To this could be added the lack of pre-anesthetic consultation (78.6%) during which the surgical risk is supposed to be assessed. However, we did not find a statistically significant relationship between emergency surgery and PDO.

acute generalized peritonitis was at the top of the list (28.6%), followed by abdominal tumors (21.4%) as reported by Touré A et al. in 2012 in the same department [5] as well as Doumbouya N et al. in Guinea [17]. In the statistical association of surgical pathologies with MPO in general surgery, tumors were among the most reported. In their retrospective cohort of 1,618 patients aged 80 or over who underwent at least one major surgical procedure, Afshar et al. [12] evaluated the existence of a link between disseminated cancers and POM, which revealed a statistically significant association between the two (p=0.001; OR: 2.10) on multivariate analysis . In the series by Marzougui et al. [12], the mortality rate was significantly higher when surgery was dictated by abdominal neoplastic pathology ($p < 0.001$). On their side, Vural et al. (p=0.018) [10] reported an absence of significant relationship between mortality after surgery and stage I tumors. This last result corroborates ours with regard to abdominal tumors, but acute generalized peritonitis was associated with MPO, with

a 6-fold increased risk (p=0.004; OR: 6.0) in univariate analysis . Neither of these two diagnoses was statistically associated with POD in multivariate analysis.

Toileting the abdominal cavity and resection of loops were the surgical procedures that caused the most deaths in our study, accounting respectively for 4/14 deaths (28.6%), 4/14 deaths (28.6%). Pearse et al. [4] conducted a large multicenter European cohort focusing on 30-day MPO, which established a significant link in univariate analysis between MPO and gastrointestinal resection (p=0.0001). The duodenum and the jejuno -ileal also occupied respectively the 1st and 4th rank of the operated organs causing the most deaths, including the pancreas and the peritoneum in this same study. In our study, there was a significant association between toileting the abdominal cavity and POM in univariate analysis. Loop resection, in multivariate analysis , demonstrated a highly significant link with postoperative death, with an 8-fold increased risk (p=0.023; OR: 8.3; CI 1.3 - 52.4). Loop resection was retained as a factor associated with MPO in our study. Resection of loops during typhoid perforations known for its high mortality could explain this in our context. The association of surgical duration with MPO is variously discussed. There was no statistically established link between MPO and duration of surgical intervention according to Elias et al. [13] in a series of 416 patients operated on in general surgery, but also Vural et al. [10] in multivariate analysis in a single-center cohort of 160 patients operated on for gastric carcinoma (mean duration of surgical intervention = 3 hours).

In contrast, two studies on colorectal surgery demonstrated a significant association between the duration of the surgical procedure and POD. Slim et al. [16] established a statistical link between a mean surgery duration of 2.1 hours and MPO (p=0.000) in univariate analysis , just like Alves et al. [9] who established the link of MPO with an average duration of 2.4 hours. These latter results were superimposable to those of our study in univariate analysis where surgical intervention lasting 2 hours or more was strongly associated with MPO (p=0.000). In multivariate analysis , surgical intervention lasting 2 hours or more was not associated with POD in our study. It was not uncommon to find that the responsibility for surgical interventions was assumed by operators of different academic levels. In our study, 51.9% of patients were operated on by doctors specializing in general surgery versus 48.1% operated on by general surgery specialists (DES). Among the 14 patients who died, 92.9% were operated on by general surgery specialists working in our department compared to 7.1% (1/14) operated on by DES doctors. This could be explained by the fact that the practice of Surgical interventions with high operative risk were reserved for general surgery specialists. In univariate analysis , we found in our study a significant association between MPO and surgical interventions performed by specialists (p=0.001); which was not the case in multivariate analysis.

In our study, infections, particularly sepsis, occupied first place (33.3%) among the postoperative complications encountered (50% in the group of deceased). Septic shock was also the predominant cause of death (57.1%). In univariate analysis , we found a significant association between sepsis and POD. Sepsis was usually the result of a surgical site infection . A larger study by Elias et al. [13] on 416 patients concluded that there was a statistical link between MPO and SSI in general (p=0.001). Let us note here that there was a notable failure in the management of postoperative complications that occurred in our patients. Most of the explorations for the diagnosis of these complications and the adaptation of postoperative therapy were lacking. Our data showed that in our sample, germ isolation was only performed in 3 patients among surgical site infections. In the group of deceased, none of the 7 cases of SSI benefited from a cytobacteriological examination and continued probabilistic antibiotic therapy (unsuitable).

Revision surgery represents an indirect sign of faulty surgery or inadequate patient control in the postoperative period. In a recent study, Launey et al. found a significant relationship between surgical revision and MPO. These authors noted in multivariate analysis that the number of surgical revisions represented a risk factor for mortality (p=0.015) [3]. In our study, 6 patients (1.5%), including 2 who died, underwent surgical revision; the latter did not emerge as a factor associated with MPO. In our study, 92.9% of deaths occurred during custody. This result raises the question of the level of vigilance observed by nursing staff during on-call duty, when we know that this period includes the usual hours of sleep for off-duty staff.

Conclusion

The analysis of mortality factors in this study allowed us to note a high risk of postoperative mortality in patients of advanced age and in those subject to resection of small bowel loops. Optimizing the perioperative management of patients presenting these identified factors could improve the surgical prognosis. Case-control studies or specific cohorts would be necessary to validate these results and identify more factors likely to influence postoperative mortality.

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