Original Article

Metabolic syndrome and in-hospital outcomes among pancreatic cancer patients

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ABSTRACT

Aims: Metabolic Syndrome (MetS) is an important etiologic and prognostic factor for pancreatic cancer, but few studies have assessed health outcomes among hospitalized pancreatic cancer patients. We examined the associations between MetS and in-hospital outcomes, i.e. pancreatic resection, post-surgery complications, in-hospital mortality and discharge disposition among hospitalized patients with pancreatic cancer.
Methods: Using the Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) dataset from 2007 to 2011, we obtained data on 47,386 patients hospitalized with a primary diagnosis of pancreatic cancer. Descriptive statistics and multivariable regression models were used to compute estimates, odds ratios and 95% confidence intervals adjusting for age, race/ethnicity, and socioeconomic status.
Results: Pancreatic cancer patients with MetS were more likely to undergo pancreatic resection (OR: 1.14, 95% CI: 1.04–1.25) compared to those without MetS. However they were less likely to experience post-surgical complications (OR: 0.90, 95% CI: 0.81–0.99), discharge to a skilled nursing facility (OR: 0.90, 95% CI: 0.83–0.93), and less likely to experience in-hospital mortality (OR: 0.52, 95% CI: 0.44–0.61) compared to those without MetS.
Conclusion: Hospitalized pancreatic cancer patients with a clinical diagnosis of MetS were more likely to receive pancreatic resection, and had reduced odds of post-surgical complications and in-hospital mortality. If confirmed in future studies, then better understanding of the biological mechanisms underlying this association will be needed, potentially leading to the development of clinical and/or molecular biomarkers to improve early diagnosis of pancreatic cancer and identify patients that may benefit from pancreatic resection.

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1. Introduction

Pancreatic cancer remains one of the most fatal cancer types, with an estimated 46,420 new diagnoses and 39,590 deaths reported in 2014 in the United States [1], and is predicted to remain the second leading cause of cancer deaths within the next decade [2]. The five-year survival rate is less than 5% and in contrast with other common cancer types, the mortality rate has not declined over the last few decades [3]. One of the main reasons for the poor prognosis of pancreatic cancer is that majority of patients are diagnosed at an advanced stage with distant metastasis and/or locally advanced un-resectable tumors [4]. At present, surgical resection is the only option for improved survival after diagnosis of pancreatic cancer [5]; however only 15% to 20% of diagnosed patients are eligible for the procedure, and even among patients with resectable disease, the survival rate is only 23% [6].

Metabolic syndrome (MetS) is cluster of related conditions that include abdominal obesity, insulin resistance, dyslipidemia and hypertension [7]. Several epidemiological studies have examined the association between MetS, its components, and risk of pancreatic cancer [8–10], and a recent meta-analyses estimated that MetS was associated with a 55% increased risk of pancreatic cancer [9]. Although the exact mechanism remains unclear, MetS has been proposed to exert its effects by promoting carcinogenesis and decreasing treatment response through insulin resistance, inflammation, and increased insulin-like growth factors [11,12]. Fewer studies examined the prognostic effect of MetS in patients

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Table 1
Baseline characteristics for hospitalized pancreatic cancer patients NIS 2007–2011.

	MetS present 4011 (8.46)	MetS not present 43,375 (91.54)	P value
Age (years)			<**0.0001**
40–49	98 (2.44)	2843 (6.55)	
50–59	586 (14.61)	7987 (18.41)	
60–69	1251 (31.19)	12,242 (28.22)	
70 and above	2076 (51.76)	20,303 (46.81)	
Gender			0.3848
Females	2003 (49.94)	21,970 (50.65)	
Males	2008 (50.06)	21,402 (49.35)	
Race			<**0.0001**
Whites	2864 (71.40)	32,428 (74.76)	
Blacks	608 (15.16)	5311 (12.24)	
Hispanics	321 (8.00)	3058 (7.11)	
Others	218 (5.44)	2551 (5.88)	
Region			**0.0053**
Large Metropolitan	2208 (55.05)	24,764 (57.09)	
Small Metropolitan	1153 (28.75)	11,344 (26.15)	
Micropolitan	392 (9.77)	4390 (10.12)	
Non-metro Non-micropolitan	258 (6.43)	2877 (6.63)	
Area-level income			<**0.0001**
Q4-Highest	892 (22.24)	11,483 (26.47)	
Q3	1030 (25.68)	10,574 (24.38)	
Q2	1056 (26.33)	10,383 (23.94)	
Q1-Lowest	1033 (25.75)	10,935 (25.21)	
Insurance			<**0.0001**
Medicare	2630 (65.57)	24,375 (56.20)	
Medicaid	209 (5.21)	3028 (6.98)	
Private	1008 (25.13)	13,485 (31.09)	
Other	164 (4.09)	2487 (5.73)	
Stage			**0.0002**
Non-metastatic/In-situ	2130 (53.10)	21,690 (50.01)	
Metastatic	1881 (46.90)	21,685 (49.99)	
Pancreatic resection			0.0520
No	3410 (85.02)	37,358 (86.13)	
Yes	601 (14.98)	6017 (13.87)	
Discharge Disposition			<**0.0001**
Routine Discharge	1751 (43.65)	17,902 (41.27)	
Discharged to skilled nursing facility	972 (24.23)	10,182 (23.47)	
Expired	134 (3.34)	2917 (6.73)	
Other	1154 (28.77)	12,377 (28.53)	
Complications			**0.0324**
No	3579 (89.23)	38,209 (88.09)	
Yes	432 (10.77)	5166 (11.91)	
No. of Comorbidities[a]	0.53 (0.76)	0.39 (0.67)	<**0.0001**
Length of Stay[a]	6.73 (5.90)	7.14 (7.41)	<**0.0001**

(N = 47,386).
Frequencies don't add up due to missing data.
[a] Mean and Standard deviation reported.