ORIGINAL ARTICLES

WOUND COMPLICATIONS DUE TO DIABETES IN PATIENTS UNDERGOING ABDOMINAL SURGERY

Rasikh Maqsood, Muhammad Ans, Ayub Ashraf Malhi, Khalid Mahmood, Hasnain Afzal, Umair Zulfiqar

Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To determine the wound complications of abdominal surgery in the patients of diabetes mellitus and associated factors at Combined Military Hospital Rawalpindi.

Study Design: Correlational study.

Place and Duration of Study: Surgery department, CMH Rawalpindi, from Nov 2018 to May 2019.

Methodology: This study was conducted on 183 patients of type 2 diabetes mellitus undergoing abdominal surgery at surgical unit of our tertiary care teaching hospital during the study period. Patients were interviewed and examined in detail after 48 hours and 1 week of surgery to look for the wound complications. Relationship of age, body mass index, gender, duration of diabetes and education was assessed with the presence of wound complications among these patients with diabetes undergoing abdominal surgeries.

Results: A total of 183 patients with type II Diabetes were included in the final analysis that underwent the abdominal surgery. Infection 24 (13.1%) was the commonest wound complication among the target population followed by pain. Mean age of patients who underwent the surgery was 40.13 ± 4.945 years. Long duration of illness and high body mass index had significant association with the presence of wound complication among the type 2 diabetes patients undergoing abdominal surgery.

Conclusion: Wound complications were common among the patients with type II diabetes. Special attention should be paid to the individuals with longer duration of illness. Patients with high body mass index should also be considered at a higher risk for developing the post-operative complications.

Keywords: Abdominal surgery, Type 2 diabetes mellitus, Wound complication.

INTRODUCTION

Abdominal surgery is one of the commonest surgery performed in secondary care as well as tertiary care teaching hospitals all over the world[1]. Usually the complication rate in controlled settings is not very high and wound healing take place in a week or two with functional recovery of almost all the patients without any premorbid factors[2].

Common wound complications of various types of abdominal surgeries include bleeding, wound herniation, wound infection etc[3]. Many factors predispose the individuals towards the wound complications and delay in the recovery. Systemic illnesses including diabetes predispose the individual towards the wound complications undergoing the abdominal surgeries[2,3].

Correspondence: Dr Muhammad Ans, Resident Surgery, AMC Mess, Rawalpindi Pakistan (*Email: mian.anas.idrees@gmail.com)*
Received: 01 Oct 2019; revised received: 26 Nov 2019; accepted: 10 Dec 2019

Diabetes has been linked with the destruction of the surgeon's miracles for a long time. A study done in 1983 in USA highlighted this issue concluding those with diabetes were at a greater risk of developing the postoperative complications[4]. A recent study done in US concluded that even in the non-diabetics, perioperative and per-operative hyperglycemia was associated with increased risk of surgical site infection[5]. Another study done in our neighboring country India concluded that patients with diabetes were more at risk of developing the wound complications as compared to the patients without the diabetes[6]. A recent meta-analysis by Martin *et al*. concluded that presence of diabetes mellitus in patients undergoing various types of surgeries may be considered as an independent risk factor for the wound complications[7].

Diabetes mellitus in an individual undergoing the surgery may affect the outcome of

surgery and cause the wound complications in number of ways. Presence of hyperglycemia itself, glucose metabolism, micro and macro vascular changes, immunocompromised status of patient, presence of polypharmacy etc. are some of the possible mechanisms by which a diabetic patient remains predisposed to the wound complications and delayed recovery[8,9].

Development of complications, long stay in hospital and more time to recovery pose the burden on individual as well as overall health care budget[10]. This really becomes more important when we are conducting the study in a developing country where heath budget is limited. This study was planned with the rationale to look for the frequency of wound complications of abdominal surgery among the patients of diabetes mellitus and associated socio-demographic factors at a tertiary care teaching hospital of Pakistan.

METHODOLOGY

This correlational study was conducted at the surgical department of Combined Military Hospital Rawalpindi from November 2018 to May 2019. Sample size was calculated by WHO Sample Size Calculator and using population prevalence proportion of 75%. With level of confidence 95%, margin of error 0.05 and anti-cipated population proportion 75% sample size calculated is >180 patients. Non probability consecutive sampling technique was used to gather the sample. All patients between the age of 18 and 60 years who suffered from type 2 diabetes mellitus and underwent any type of abdominal surgery were included in the study. Patients who were undergoing second surgery in less than one month time were also excluded. Patients with bleeding disorders, leukemia and lymphomas were also part of the exclusion criteria. Immunocompromised patients, autoimmune disorder patients and patients on long term steroids were also not included. Pregnant ladies and illicit drug users were also not approached to participate in the study or were excluded at the first step.

Institutional review board of our hospital approved the study and IRB with letter no 29-5-19 has been submitted to the journal. Patients who had type 2 DM and who underwent any type of abdominal surgery were sampling unit of our study and were enrolled after the written informed consent from surgical department of our own hospital. Type 2 DM diagnosis was confirmed by a consultant medical specialist and patients with DM duration of more than 1 year were included in the study. All types of routine abdominal surgeries except those done in emergency were included in the analysis. Post-operative pain among the study participants around the wound was ascertained by the visual analogue score. Relationship of age, Body mass index (BMI), gender, duration of diabetes and education was assessed with the presence of wound complications among these patients with diabetes undergoing abdominal surgeries. Researchers collaboratively designed a special proforma to conduct this research catering for all the relevant parameters for this study. BMI was categorized according to the WHO guidelines and score of 24 was used as cut off in this study. Visual analogue score was recorded for all the participants and value of more than 6 was considered as positive for having a considerable pain.

All statistical analysis was performed by using SPSS-24. Frequency and percentages were calculated for qualitative variables. Mean and standard deviation were calculated for quantitative variables in the study. Chi-square was applied first followed by binary logistic regression analysis in our study. The *p*-value less than or equal to 0.05 was considered significant.

RESULTS

A total of 196 patients were initially approached to get them included in the analysis. Six (3.1%) had uncontrolled hypertension, one (0.5%) had history of heroine dependence, three (1.6%) had autoimmune or bleeding disorder, one (0.5%) had hypothyroidism and two (0.9%) did not give consent to include them in the study. Out of 183 patients included in the final analysis, 116 (63.4%)

were male and 67 (36.6%) were female. Mean age of patients who underwent abdominal surgery was 40.13 ± 4.945 years. Mean duration of diabetes among these patients was 6.13 ± 3.481 years. Most of the patients under-went hernioplasty. Other characteristics of study population have been summarized in table-I. Infection 24 (13.1%) was the commonest complication among the target population followed by pain. Chi-square was applied first and longer duration of illness and high BMI had statistically significant association with presence of wound complications. Longer duration of illness and high BMI also had significant asso-ciation with the presence of wound complication among the patients undergoing abdominal surgery as summarized in table-II.

Table-I: Characteristics of study participants (n=183).

Parameters	n (%)
Age (years)	
Mean ± SD	40.13 ± 4.945
Range (min-max)	19-60 years
Gender	
Male	116 (63.4%)
Female	67 (36.6%)
Duration of Illness	6.13 ± 3.481 12 month - 15 years
Surgeries Performed	
Hernioplasty	56 (30.6%)
Laparotomy	39 (21.3%)
Laparoscopic cholecystectomy	32 (17.5%)
Appendectomy	34 (18.6%)
Open cholecystectomy	12 (6.5%)
Others	10 (5.4%)
Wound Complications (n=78)	
Infection	24 (13.1%)
Pain	19 (1.3%)
Bleeding	16 (8.7%)
Wound dehiscence	10 (5.4%)
Others	9 (4.9%)

DISCUSSION

Diabetes is a chronic condition which is only treatable but not curable. Patient has to undergo lifestyle modifications and take medications throughout the life. Despite adequate control, it poses certain issues for the patient including decrease in the immunity and delayed healing process after the surgery[12,13]. Hussain *et al* in their study have clearly highlighted the fact that situation in our country is worse as usually either patients remain undiagnosed or even if diagnosed fall in the range of poorly controlled DM[14]. Therefore it become necessary for the medical professionals other than endocrinologist or internal medicine specialist to know what diabetes can do with the patients with regards to their domain. Surgery is one of the specialties which directly or indirectly deals with the diabetics. This study was aimed at its indirect effect i.e. its effect on complications of wound after the abdominal surgery.

Male to female ratio in this analysis was 1.73:1 clearly highlighting the male predominance in patients suffering from diabetes mellitus undergoing abdominal surgery. Rasul *et al* in their study done on sample from our part of the world revealed similar findings in this regard of gender wise distribution of patients with diabetes undergoing abdominal surgery[11]. Reason might be either females have lesser chance of getting DM or abdominal pathology requiring the surgery in our part of the world or that females

Table-II: The correlated factors relating to presence of wound complications among the Patients with type II diabetes undergoing abdominal surgery: the binary logistic regression analysis.

Parameters	*p*-value	Odds Ratio	Confidence Interval	
			Lower	Upper
Age (ref. is ≤30 years)	0.552	0.883	0.373	2.095
Duration of illness (ref. is <5 years)	<0.001	13.088	3.978	43.066
Gender (ref. is male)	0.540	1.239	0.612	2.511
Education (ref. is ≥ matriculate)	0.340	0.684	0.313	1.493
BMI (ref. is BMI <24)	<0.001	4.228	1.998	8.947

have less chance in our country as compared to male patients to reach a tertiary care facility. There was a systematic error in our study as well as selection and recruitment of study participants was done from a military hospital which automatically decrease the chances of major group of population to get enrolled in the study.

Infection 24 (13.1%) was the commonest wound complication in our study population followed by the pain. Similar findings were reported in the studies done in past in other parts of the world by Mangrulkar *et al*[6] and Jacobson *et al*[15]. Their studies clearly highlighted that most common complications in their setting were infection and pain. Reason might be immune-compromised status of the patient due to a long standing metabolic illness accompanied by decreased threshold to pain. Colonization by unusual bacteria and dietary factors may contribute. Whatever the reason may be these two postoperative findings should be taken into account for successful recovery and improved overall quality of life of patient.

Longer duration of diabetes was found to be strongly related to presence of wound complications among the patients with type II diabetes mellitus undergoing abdominal surgery in our set up. Huang *et al* concluded that long duration of DM was significantly related to presence of surgical complications (p-value <0.05) in their analysis[16]. It is very much logical that longer the duration of illness even if it is treated well, it is associated usually with more complications. In our country there is a great number of patients who have poorly controlled illness so poorly controlled long standing illness can prone the individuals towards all the illness related complications including the delayed wound healing and other problems.

Increasing age has been a consistent correlate to presence of surgical complications among the patients suffering from DM in studies done in the past[16,17]. Corriere *et al* did an interesting study in this regard and increasing age has statistically significant relationship (p-value<0.05) with presence of surgical complications[17]. Our study did not support the past findings and increasing age was not significantly linked to the presence of wound complications after the surgery in patients with DM. Reason might be more care imparted to old patients in our culture or lesser number of older patients in our target population. More studies in the future can look into these findings and ascertain this factor.

Mangrulkar *et al*[6] in their study done in our neighboring country concluded that high BMI has been more linked to surgical complications in the patients undergoing surgeries as compared to the normal BMI[16]. Ri *et al* in a recent study also emphasized that the influences of obesity on surgery are made even more complex by various categories of operative outcomes, surgical procedures, and differences in obesity among races. Therefore, it is important to appropriately evaluate perioperative risk factors, including obesity[18]. Results were supported by our findings as raised BMI had a statistically significant association with presence of complications among diabetic patients undergoing abdominal surgery in our population. Raised BMI could be directly responsible for the findings generated in the study and previous studies or raised BMI might be due to poorly controlled or long-standing diabetes. Diabetes and BMI also have a bimodal relationship so all these facts should be taken into account in this regard before generalizing the results.

In addition to the strengths, there were few limitations as well. This was not a cohort study or a survival analysis so what happened finally with the patient regarding the abdominal surgery could not be ascertained. Patients taking oral hypoglycemic and insulin should have been classed separately to look for outcome in each group. Long term glycemic control prior to the surgery should also have been taken into account. Improved study design, large sample size and better representation of the target population may be better approached to obtain generalized results among the diabetic patients undergoing abdominal surgery.

CONCLUSION

Wound complications are common among the diabetic patients. Special attention should be paid to the individuals with longer duration of illness. Patients with high BMI should also be considered at a higher risk for developing the post-operative complications.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES

1. Rose J, Weiser TG, Hider P, Wilson L, Gruen RL, Bickler SW. Estimated need for surgery worldwide based on prevalence of diseases: a modelling strategy for the WHO Global Health Estimate. Lancet Glob Health 2015; 3 (Suppl-2): S13-20.
2. Simões CM, Carmona MJC, Hajjar LA, Vincent JL, Landoni G, Belletti A, et al. Predictors of major complications after elective abdominal surgery in cancer patients. Bio Med Center Anesthesiol 2018; 18(1): 49-56.
3. Aksamija G, Mulabdic A, Rasic I, Aksamija L. Evaluation of Risk Factors of Surgical Wound Dehiscence in Adults After Laparotomy. Med Arch 2016; 70(5): 369-72.
4. Gusberg RJ, Moley J. Diabetes and abdominal surgery: the mutual risks. Yale J Biol Med 1983; 56(4): 285-91.
5. Gachabayov M, Senagore AJ, Abbas SK, Yelika SB, You K. Perioperative hyperglycemia: an unmet need within a surgical site infection bundle. Tech Coloproctol 2018; 22(3): 201-07.
6. Mangrulkar S, Khair PS. Comparison of healing of surgical wounds between diabetics and non-diabetics. J Indian Med Assoc 2009; 107(11): 765-70.
7. Martin ET, Kaye KS, Knott C, Nguyen H, Santarossa M, Evans R, et al. Diabetes and risk of surgical site infection: a systematic review and meta-analysis. Infect Control Hosp Epidemiol 2015; 37(1): 88-99.
8. Leung V, Ragbir-Toolsie K. Perioperative management of patients with diabetes. Health Serv Insights 2017; 15(10): 1178632917735075.
9. Blakytny R, Jude E. The molecular biology of chronic wounds and delayed healing in diabetes. Diabet Med 2006; 23(6): 594–608.
10. Fatima I, Humayun A, Anwar MI, Iftikhar A, Aslam M, Shafiq M. How do patients perceive and expect quality of surgery, diagnostics, and emergency services in tertiary care hospitals? An evidence of gap analysis from Pakistan. Oman Med J 2017; 32(4): 297-305.
11. Rasul A, Muhammad Y, Gondal KM, Siddique H, Karn AK. Prevalence of obesity in surgical patients undergoing abdominal surgery at mayo hospital lahore Pakistan. Pak J Med Health Sci 2016; 10(3): 713-15.
12. Yong PH, Torkamani LWN, Churilov L, Churilov L, Robbins RJ, Ma R, et al. The presence of diabetes and higher HbA1c are independently associated with adverse outcomes after surgery. Diabetes Care 2018; 41(6); 1172-79.
13. Jacobsen LM, Haller MJ, Schatz DA. Understanding Pre-Type 1 Diabetes: The Key to Prevention. Front Endocrinol (Lausanne) 2018; 9(3): 70-75.
14. Hussain A, Ali I. Diabetes mellitus in Pakistan: A major public health concern. Arch Pharma Pract 2016; 7(1): 30-32.
15. Chen S, Anderson MV, Cheng WK, Wongworawat MD. Diabetes associated with increased surgical site infections in spinal arthrodesis. Clin Orthop Relat Res 2009; 46(7): 1670-73.
16. Huang ES, Laiteerapong N, Liu JY, John PM, Moffet HH, Karter AJ. Rates of complications and mortality in older patients with diabetes mellitus: the diabetes and aging study. JAMA Intern Med 2014; 174(2): 251-58.
17. Corriere M, Rooparinesingh N, Kalyani RR. Epidemiology of diabetes and diabetes complications in the elderly: an emerging public health burden. Curr Diab Rep 2013; 13(6): 805-13.
18. Ri M, Aikou S, Seto Y. Obesity as a surgical risk factor. Ann Gastroenterol Surg 2017; 2(1): 13-21.