EVALUATION OF SURGICAL SITE INFECTION IN ABDOMINAL SURGERIESIN THE DEPARTMENT OF GENERAL SURGERY IN A TERTIARY CARE CENTRE- AN OBSERVATIONAL STUDY

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ABSTRACT

Background: Surgical site infection is increasingly recognized as a measure of the quality of patient care by surgeons, the incidence of SSI in our environment is still high when compared to the developed world.

Objectives: This study was conducted to evaluate the incidence, risk factors and the types of Surgical Site Infection (SSI) in postoperative abdominal surgeries.

Methods: Immediate postoperative period of the patients was followed up. Wound was examined on day 2, then everyday till the day of discharge. Signs of SSI were looked for. If the patient developed SSI in this period, then type of SSI was classified and swab culture was performed to identify the microorganism and antibiotic sensitivity pattern. CDC (Centre for disease Prevention and Control) criterion was used for diagnosis and classification of SSI. Patient was treated and discharged. All the details were recorded in the proforma. The patients were followed up every week till 30 days.

Results: The SSI rate in our study was 14% and risk factors associated with SSI in our study are smoking (p=0.001), preoperative stay of> 3days (p=0.000), ASA score (p=0.001), contaminated and dirty wound (p=0.000), duration of surgery (p=0.010) and duration of drain placement (p=0.000).

Conclusion: Our study prompts us to look at the gaps in our surgical and infection control protocols which will enable policy formulation that will foster a reduction in wound infection rate. SSI can be reduced by decreasing the preoperative hospital stay, appropriate antibiotic administration policies, adequate preoperative patient preparation, reducing the duration of surgery to minimum, judicious use of drains and intraoperative maintenance of asepsis and following operation theatre discipline properly.

Keywords: Abdominal Surgeries, ASA Score, Glycemic Control, Surgical Site Infection (SSI)

INTRODUCION

Surgicalsiteinfections(SSIs)areinfectionsoftheincisionororganor spacethatoccuraftersurgery.Theterm ‘surgicalsiteinfection’(SSI)wasintroducedin1992toreplacethepreviousterm ‘surgicalwoundinfection’.Surgicalsiteinfection(SSI)hasalwaysbeenamajorcomplicationofsurgery andtraumaandhasbeendocumentedfor4000–5000years.SSI isboththemostfrequentlystudiedandtheleadingHAIreportedhospitalwideinLMICs.WorldHealthOrganization(WHO)CleanCare isSaferCareprogrammeshowsthatsurgicalsiteinfection(SSI)affectsuptoonethird ofpatientswhohaveundergoneasurgicalprocedureinLMICsandThepooledincidenceofSSIwas11.8per100surgicalpatientsundergoingthe procedure(range1.2to23.6).[1,2]

AlthoughSSIincidenceismuchlowerinhigh-incomecountries,itremains afrequenttypeofHAIinEuropeandtheUnitedStatesofAmerica(USA).InsomeEuropeancountries,itevenrepresents themostfrequenttypeofHAI. SSIsareamongthemostpreventableHAIs,buttheystillrepresentasignificantburdenintermsofpatient morbidityandmortalityandadditionalcosts tohealthsystemsandservicepayersworldwide.[3]EachSSIisassociatedwithapproximatelyadditionalpostoperativehospitaldaysandpatientswithanSSIhavea2-11timeshigherriskofdeath,comparedwithoperativepatientswithoutanSSI.[4] Surgicalpatientsinitiallyseenwithmorecomplexcomorbidities andtheemergenceofantimicrobial-resistantpathogensincreasethecostandchallengeoftreatingSSIs.[5]

Forthesereasons,thepreventionofSSIhasreceivedconsiderableattentionfrom surgeons, infectioncontrolprofessionals andhealthcareauthorities,themediaand thepublic.This study was conducted toevaluatetheincidence,risk factors and the types of Surgical Site Infection (SSI)in postoperativeabdominalsurgeries.

METHODOLOGY

This prospectivestudy was performed inESICMedical College and PGIMSR,Chennai, in the period18monthsfrom April2018toSeptember2019. 100 adult patients undergoing elective and emergency abdominal surgeries were selected. The ethical standards for human experimentation were followed during the study and permission from the institutional ethical committee was taken.

PatientswithHIV,HBVorHCVinfection, patientsonchemotherapyandradiotherapy, patientsonoralsteroidsandotherimmunosuppressantdrugs, patientswithhepatic,cardiacandrenalfailure, andASA(AmericanSocietyofAnaesthesiologists)scoreIVorV were excluded from the study.

Study procedure:Informed written consent was obtained. Appropriate history was taken;Clinical examination and relevant investigations were carried out. Intravenous antibiotic was given 30–60 minutes before theprocedure.Appropriatesurgicalmanagementwas carriedoutunderstrictasepticprecautions.

Immediatepostoperativeperiodofthepatientswasfollowedup.Woundwasexaminedonday2,thenever ydaytillthedayofdischarge.SignsofSSIwerelookedfor.IfthePatientdevelopedSSIinthisperiod,thent ypeofSSIwasclassifiedandswabculturewasperformedtoidentifythemicroorganism andantibiotic sensitivitypattern.CDC(CentrefordiseasePreventionandControl)criterionwasusedfordiagnosisand classificationofSSI.Patientwastreatedanddischarged.Allthedetailswererecordedintheproforma.Th epatientswerefollowedupeveryweektill30days.IfthepatientdevelopedanyfeaturesofSSIduringfollo wupperiodafterdischarge,thenpatientwastreatedaccordinglyasdescribedabove.Alldetailswererecor dedintheproforma.

Data was collected and calculated datawerearrangedinsystemicmanner,presentedinvarioustableandfiguresandstatisticalanalysiswas madetoevaluatetheobjectivesofthisStudywiththehelpofSPSS.TheChisquarecalculationwas done.

RESULTS

Inourstudymaximum numbersofpatientswere35to65yearsofage and predominantly male. 12patientswereknowndiabetic, 14patientsweresmokers. Inourstudy95patientshadpreoperativestaylessthan3days. Inourstudy3patientshadelevatedbloodsugarlevel>200mg/dl.There weremoreemergencysurgeries (64)thanelectivesurgeries (36). Outof58malepatients26wereanaemic.Noneofthe patientsrequiredbloodtransfusion.Majorityofpatientswereoftheagegroup13to35years.Allthemalep atientsabove65yearsofagewerewith low hemoglobin. Inourstudy64patientscameunderASAscoreI.

Majorityofsurgicalwound werecleancontaminated. Durationofsurgerywas>2hrsfor71procedures. Drainagetubewasplacedin31surgeries. 74patientshadpost-operativestayperiodof3-7days.23patientshad prolongedhospitalstay.Allpatientswereunderglycemiccontrolduringthepost-operativeperiod. 71patientswerestartedonoralfeedsbetween24and48hours. Outof14patientswhodevelopedSSI,13had superficial SSI.1hadorganSpaceSSI.NopatientshaddeepincisionalSSI.

Out14patients9were35-65yearsofage.Theinfectionratewas18.4%(9/49). Inthisagegroupwhilethatinage>65yearsis25%(1/4). 10outof14patientsweremales.Bothageandsexwerefound notcorealated withSSI. 3patientswhohaddiabetesmellitusdevelopedSSI.Theinfectionratewas25%(3/12).Diabetesmellitus wasnotariskfactorforSSIinourstudy. 6patientsweresmokers.Theinfectionrateamong smokerswas42.9%.SmokingwasfoundtobeassociatedwithSSI(P=0.001). 12patients werehavingnormalBMI.Patients undernutritionandobesitywerenotfoundtobeassociated withSSIinourstudy. AllpatientswhodevelopedSSIwereunderglycemiccontrolbothduringpreoperativeandpostoperative period.SowecouldnotestablishanyassociationbetweenSSIandperioperativeHyperglycemiainourstu dy. Outof4femalepatientswhodevelopedSSI,3werefoundtohaveanaemia withinfectionrateis10.3% (3/26).

SevenpatientswithSSIhadlowserum albuminlevel.Theinfectionrateis20%(7/35)inpatientswithhypoalbuminemia,whichisnotstatistically significant. 4patientshadpreoperativestayperiodof>3days.Theinfectionratewas80%(4/5),whichwassignificantlyassociatedwithSSI(P=0.000). TheinfectionrateinpatientswithASAclassIIis28.1%(9/32)andclassIII was50%(2/4).HigherASAscoreissignificantlyassociatedwithSSIinour study (p=0.001).Outof14patients,10patientshaveundergoneemergencyprocedure.Theinfectionrateinpatientswhounderwentemergencyprocedurewas12%(10/83)ascomparedtothatelectiveis23.5%(4/17).

Contaminatedanddirtywoundsweresignificantly associatedwithSSI(p=0.000).11casesoutof14werefoundtohavecontaminatedwound. AllpatientswithSSIhaddrainplacedfor>4days.Thisissignificantly associatedwithSSI (p=0.0). Morethan1organism wasisolatedintheswabcultureof5patients.Themostorganisms isolatedwereEscherichiacoli.

The SSI rate in our study was 14% and risk factors associated with SSI were smoking (p=0.001), preoperative stay of> 3days (p=0.000), ASA score (p=0.001), contaminated and dirty wound (p=0.000), duration of surgery (p=0.010) and duration of drain placement (p=0.000).All the details are tabulated in the table and images in atlas.

DISCUSSION

Largenumberofstudiesreportedsurgicalsiteinfectioninabdominalsurgeriesbetween3.4%and36.1% 96.Inourstudyoutof100patientswhounderwentabdominalsurgeries,14patientsdevelopedSSI.TherateofSSIinourstudyis14%.ThisiscomparabletomanystudiesinIndiaandishighercomparedtodevelopedcountriesandlessascomparedtofewIndianstudies.ThisisduetothefactthatindevelopedcountriestheyhaveasystematicfeedbackofSSIrateandsurveillancebodiessuchasHospitalsinEuropeLinkforInfectionControlthroughSurveillance(HELICS)InEuropeandNationalNosocomialInfectionSurveillance System (NNIS)inUnitedStatesofAmericawhereasinourcountryweremainlyonsporadicsurveys.[6]

Inourstudymostofpatientswereofmiddleagegroup(35-65years)andtherewasmalepreponderance.TheriskfactorsassociatedwithSSIinourstudyaresmoking (p=0.001),preoperativestayof>3days(p=0.000),ASAscore(p=0.001),contaminatedanddirtywound (p=0.000),durationofsurgery(p=0.010)anddurationdrainplacement(p=0.000).

Ourstudydidnotf indassociationbetweenSSIandBMIgrading,anaemia as well as hypoalbuminemia.Inour study smokingwasfoundtobeassociatedwithSSIlikepreviousStudies.[7]Theinfectionrateamongsmokersis42.9%(6/14)whilethatinNon-smokersis9.3%(8/86).Preoperativestaydurationof>3daysissignificantlyassociatedwithSSI.Theinfectionrateis80%inpatientswithPreoperativestayof>3daysascomparedto10.5%inpatientswith<3Daysduration.Similarfindingisobservedinmanystudies.[8,9,10]

PatientswithASAclassof2and3areassociatedwithSSI.Thisis comparabletopreviousstudies.[11,12]Theinfection rate in ASA classIIPatientsis28.1%andinclassIIIare50%.InourstudycontaminatedanddirtyWoundwereassociatedwithSSIasobservedinpreviousstudies.Theinfectionrateincontaminatedwoundis91.7%(11/12)whileindirtyWounditis50%(1/2).Durationofsurgery>2hoursdurationissignificantly assosciatedwithSSI.Reportsfrom otherstudieswereinagreementwithour findings.[8,10,11]Theinfectionratewas19.7%(14/71)inpatientswhenthedurationofsurgerywas>2hours. Nopatientwith surgery duration<2hoursdevelopedSSIinourstudy(0/29).Durationofdrainplacementfor>4daysisassosciatedwithSSIinourstudy.Similarfindingwasobservedinmanystudies.[8,10,12]Theinfectionratewas60.9%inpatientswithdrainplacedfor>4days.Themostcommondiseaseconditionencounteredinourstudyisacuteappendicitiswithorwithoutabscessandsurgicalprocedureobservedisemergencyopenappendectomy.SSIwasmostcommonlyobservedinappendicularabscessandduodenalperforation.SSIwasnotedon 4thpost-operativedayfor9patientsand5thpostoperativedayfor5patients.NoneofthepatientsdevelopedSSIafterdischargefrom hospital. The endogenousfloraisresponsibleforinfectioninmostcases.Theopeningofthegastrointestinaltractincreasesthelikelihoodof Gram-negativebacillithatwasourfindinginthisstudy.ThemostcommonorganismisolatedwasE.coli.Itwasisolatedin50%ofswabculture.ThisissimilartothefindingobservedbySatyanarayana V et al andRaka L et al.[13,14]

PseudomonasandProteusmirabiliswerenextmostcommonorganismsisolated.Morethan1organism wasisolatedintheswabcultureof5patients.E.coliwasfoundsensitivetopiperacillinandTazobactum, Imipenam,Colistin.Theotherorganismsobservedinswabculturewereklebseilla, Staphaureus,MRSA.Swabculturewassterilein3patientsinourstudy.InpatientswhodevelopedSSI,13 patientshadsuperficialSSI.1patienthadorganspaceSSI.Noneofthepatientsdevelopeddeepincisional SSI.Secondarywoundclosurewasdonefor9(64.3%)patientswhohadSSI Withresidualwounddehiscencewithhealthygranulationtissueinwhomspontaneousclosuredidnotoccur.AllpatientswithSSIhadprolongedPost-operativestaydurationofmorethan7days.

CONCLUSION

Ourstudypromptsustolookatthegapsinoursurgicalandinfectioncontrolprotocolswhichwillenablepolicyformulationthatwillfosterareductioninwoundinfectionrate.SSIcanbereducedbydecreasingthepreoperativehospitalstay,appropriateantibioticadministrationpolicies,adequatepreoperativepatientpreparation,reducingthedurationofsurgerytominimum,judicioususeofdrainsandintraoperativemaintenanceofasepsisandfollowingoperationtheatredisciplineproperly.

Althoughsurgicalsiteinfectionscannotbecompletelyeliminated,areductionintheinfectionratetoaminimallevelcouldhavesignificantbenefits,byreducingpostoperativemorbidityandmortality,andwastageof healthcareresources.Adedicatedsystem ofinfectionsurveillancehastobeestablishedtoidentifythegapsinourinfectioncontrolprotocolsandthereforeidentifyareasoffocustoreducetheburdenofSSIs.Itwillalsohelptoindividualizepoliciesregardinginfectioncontrolindifferentsetups.

AppropriateprecautionarymeasurehastobetakentoreducetheincidencesofSSIthatoriginateprimarily from thecareproceduresprovidedduringhospitalization.Asoundantibioticpolicy,reducingthelengthofproceduresbyadequatetrainingofthestaffonpropersurgicaltechniques,proper intraoperativeinfectioncontrolmeasuresandfeedbackofappropriatedatatosurgeonsregardingSSIswouldbedesirabletoreducethesurgicalsiteinfection.

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ATLAS

A. Discharge form suture site suggesting superficial SSI

B. Wound Gaping

C. Pus collection for culture and sensitivity pattern

Table: Relationshipbetweenclinicalparametersandincidenceof SSI

Parameters	Subgroup	SSI present frequency (%)	SSI absent frequency (%)	X^2	DF	'P' value
Age group	13-35	4(8.5)	43(91.5)	2.355	2	0.308
	36-65	9(18.4)	40(81.6)			
	>65	1(25.0)	3(75.0)			
Gender	Male	10(17.5)	47(82.5)	1.383		0.240
	Female	4(9.3)	39(90.7)			
DM	Yes	3(25.0)	9(75.0)	1.370	1	0.242
	No	11(12.5)	77(87.5)			
Smoking	Yes	6(42.9)	8(57.1)	11.259	1	0.001
	No	8(9.3)	78(90.7)			
BMI	<18.5	2(18.2)	9(81.8)	0.332	2	0.847
	18.5-25	12(13.6)	76(86.4)			
	>25	0	1(100)			
Random blood sugar	<200	14(14.4)	83(85.6)	0.503	1	0.478
	≥200	0	3(100)			
Hb male	<13	5(19.2)	21(80.8)	0.131	1	0.718
	≥13	5(15.6)	27(84.4)			
Hb female	<12	3(10.3)	26(89.7)	0.073	1	0.787
	≥12	1(7.7)	12(92.3)			

Albumin	<3.5	7(20.0)	28(80.0)	1.610	1	0.204
	≥3.5	7(10.8)	58(89.2)			
Pre op- Stay duration (days)	≥3	10(10.5)	85(89.5)	19.042	1	0.00
	<3	4(80.0)	1(20.0)			
ASA	I	3(4.7)	61(95.3)	14.218	2	0.001
	II	9(28.1)	23(71.9)			
	III	2(50.0)	2(50.0)			
Type of procedure	Emergency	10(12.0)	73(88.0)	1.545	1	0.214
	Elective	4(23.5)	13(76.5)			
Type of wound	Clean	0	1(100)	72.013	3	0.00
	Clean contaminated	2(2.4)	83(97.6)			
	Contaminated	11(91.7)	1(8.3)			
	Dirty	1(50.0)	1(50.0)			
Duration of surgery	≤2	0	29(100)	6.649	1	0.0
	>2	14(19.7)	57(80.3)			
Post-op- Stay duration (days)	<3	0	3(100)	54.499	2	0.0
	3-7	0	74(100)			
	>7	14(60.9)	9(39.1)			
Drain placement (days)	<4	0	8(100)	8.879	1	0.0
	>4	14(60.9)	9(39.1)			
p<0.001; NS–NotSignificant						