Research Paper

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Clinical Study on Post Operative Wound Infections

General Surgery

KEYWORDS : wounds, type of surgeries, Micro-organisms

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ABSTRACT

Causesofpost-operativewoundinfectionare multifactorial, determined bytheinteractionofseveralfactors:thenatur eanddegree of contaminationofthewound,localtissuefactorsandthegeneralresistanceof thepatientprobablymodified bytherapeuticmeasures.Variousfactorsboth intrinsicandextrinsictothepatienthavebeenincriminatedtowoundsepsis.This is a prospective study conducted in the General surgery department during the period between June 2011 to Oct 2013. Out of the 346 wounds in the study 47 got infected. Of these 27 were mild infections, 11 were moderate infections and 9 were severe infections including 1 burst abdomen. The overall infection rate in this study was 13.58%.

AIMSOFSTUDY

1. ToestimatetheincidenceofinfectionindepartmentofGeneral-surgery of ASRAM
2. To determine the various determinants of infection such as age, sex, nature of surgery, urgency ofsurgery,duration ofsurgery,anemia, diabetes,durationofpre-operativehospitali zation,Usageofdrainsand theirrelationshiptowoundinfection.
3. To determine the various microorganisms responsible for-wound. infection.

MATERIALSANDMETHODS

This is a prospective study conducted in the General surgery de-partmentduringtheperiodbetweenJune2011toOct2013.

MATERIALS:

Atotalof346surgicaloperations,bothemergency aswellaselective surgeriesdoneduringtheabovespecifiedperiodwerestudied.

Minor surgicalprocedures were not considered and procedures in whichwoundsareleftopenandoperations onulcerswereexclud-ed.There werenodeathsduetopost-operativewoundinfection.

ExclusionCriteria:

1. Woundswhichwerelaidopenandoperationsonulcerslikeskin grafting.
2. Perianalsurgeriesinwhichpost-opcontaminationisimminent.
3. Deathsduetoreasonsotherthaninfection.

Outofthe346cases274weremalesand72females.Themeanageofthe patientswas39yearsandrangedfrom8yearsto72years.

METHODS

Individual cases were analyzed with regard to the following par-ticulars:

i. Age ii. Sex
iii. Date of admission,Dateofsurgery(tocalculatethepreoperative hospitalization)
iv. Haemoglobin(13gms%=normal,10-13=mildanemiaand<10% =Severeanemia)
v. Presenceof anysepticfocusvi. Diabetes
vii. Hypertension
viii. Useof anydrugs.

Operativedata:

i. Surgerydone
ii. Type of anaesthesia
iii. Duration of surgery
iv. Nature of surgery (Clean, Clean-contaminated, Contami-natedand Dirty),
v. Urgencyof surgery(EmergencyandElective), vi. Preopera-tivepreparation,
vii. Drainsusedor not

Standard surgicalprotocolwasfollowed inallthecases.Asingle-dose peri-operativeantibioticprophylaxisusingInj.AmpicillinIg-mwasgivento allthepatientsatthetimeofinductionofanaesthesia. Postoperatively AmpicillinandGentamycin weregivenformost-ofthecasestillthetimeof sutureremovalandincaseof abdominal-surgeriesmetrogylwasadded.

Allthe346woundswereinspected forevidenceofwoundin-fection suchaserythemabeyond5mmofincision,woundd ischargeandgapingof thewoundonthe3rdpost-operative day,atthetimeofsutureremovaland afteronemonthatfollowup.Vit alchartingwasdone,duringthepatientsstay inthehospital.Post-op-erativefeverwascorrelatedwiththewoundfindingsas it couldbedu-etoreasonsotherthanwoundinfection.Anydischargefromthe woun dwassentforbacteriologicalevaluation,cultureandsensitivity.

Woundinfectionis gradedas follows.

Grade1

(Stitch Abscess) : Rednessor pustulesnearoneor morestitches.

Grade2

(MildInfection) : MinorInfectionofwoundwithoutsepara-tionof wound edges. Slight sero-purulent or purulent discharge. Nosystemicreaction.

Grade3

(ModerateInfection) : Frankinfectioninrelativelyasmallportionof thewoundwithpurulentdischargeandpossibly somesystemicreac-tionpresent.

Grade4

(SevereInfection) : Frankinfectionofalargeportionofthewound with abscessformation usually with systemic reactionandwound-dehiscence.

Incaseofwoundinfectionadditionalproceduresweredonetodeal with theinfection. Stitch abscesseswere drained and dressed. Mild andmoderateinfectionsweredresseddailyandappropriate antibioticswere started.Aftercontrolofinfectionsecondarysutur-ingwasdone.Incaseof burstabdomenimmediatetensionsuturing-wasdone.

STATISTICALANALYSIS:

MicrosoftExcelComputerprogramme wasusedforanalysisofdata. Chisquare testwasusedtotestthestatisticalsignificanceoftheresults.Odds ratiowascalculatedtomeasurethestrengthofassociationof-variousfactors towoundinfection.

Thedifferentsurgeriesstudiedareshownintable No 1 & 2

Table.1:Showingthedifferentoperationsstudied ElectiveOperations

Diagnosis	Operation	Total	Infected
Chronic Duodenal Ulcer	Bil.TruncalVagotomy+ Gastro– Jejunostomy	5	3
GallStones	Cholecystectomy(open/ laparoscopic)	15	2
CaStomach	Gastro-jejunostomy	4	1
InguinalHernia	Hernioplasty	60	4
ReccurentHernia	Hernioplasty	15	
Varicocele	Palomooperation	4	
Cong.Hydrocele	Herniotomy	2	
Hydrocele	Sac Eversion	56	5
Encysted Hydrocele of Cord	Excision	3	
CaBreast	Modified RadicalMastectomy	10	1
SolitaryThyroid Nodule	Hemithyroidectomy	12	
Multinodulargoiter	SubtotalThyroidectomy	6	
Ca.Thyroid	TotalThyroidectomy	4	
T.A.O.	A.K.Amputation	2	1
T.A.O.	B.K.Amputation	2	1
VaricoseVeins	Saphenous VeinLigation+Stripping	17	1
Ca.Penis	Partial/Totalpenectomy	2	
IncisionalHernia	Hernioplasty	10	2
SoftTissue Tumours	Excision	5	1
	Total	234	23

TABLE 2 EmergencyOperations

Diagnosis	Operation	Total	Infected
Acute Appendicitis	Appendicectomy	39	2
Appendicular Perforation	Appendicectomy	5	2
Peptic Ulcer Perforation	PerforationClosure.	34	11
Obstructed InguinalHernia	Herniorrhaphy	7	1
Strangulated InguinalHernia	IlealResection+ Herniorrhaphy	1	
Strangulated IncisionalHernia	IlealResection+ Repairof Hernia	1	
SmallBowel Perforation	PerforationClosure	6	3
SmallBowel Perforation	BowelResection+ Anastamosis	1	
SmallBowelGangrene	BowelResection+ Anastamosis	1	
BluntInjuryAbdomen	Spleenectomy	1	
BluntInjuryAbdomen	JejunalTear Closure	2	1
BluntInjuryAbdomen	SuturingofLiverLaceration	3	
IntestinalObstruction	(Post-Op)Adhesionolysis	1	
IntestinalObstruction	Resection of StricturedBowel	3	
RepturedAmoebic Liver Abscess	Laparotomy+ PeritonialToilet	4	3
Sigmoid Volvulus	Sigmoidectomy	3	1
	Total	112	24

RESULTSAND ANALYSIS

Outofthe346wounds inthestudy47got infected.Ofthese27were mildinfections,11weremoderate infectionsand9weresevereinfections including1 burstabdomen. The overallinfectionrate in this study was13.58%.

Theinfectionrateaccordingtothenatureofinfectionisshownin

Incidenceof post-operativewoundinfectionaccordingtothe natureofsurgery (n=346)

TABLE 3

Nature of Surgery	No of infected	No of uninfected	Total	ODDS Ratio (95% C.I)
Clean	14(7.29%) 29.79%)	178(92.71%) 59.53%)	192 (55.49%)	1.00
Clean Contaminated	8(10.13%) 17.02%)	71(89.87%) (23.75%)	79 (22.83%)	1.43 (0.58-3.53)
Contaminated &Dirty	25(33.33%) 53.19%)	50(66.67%) 16.7%)	75 (21.68%)	6.36 (3.06-13.20)
Total	47(13.58%)	299(86.42%)	346	

Theinfectionratewashigher inthecontaminatedanddirtyoperations. Thoughtheoddsratiosuggeststhattheincidence ofinfectioninclean contaminated casesis1.43timesthatincleancases,itisnotstatistically significantasshownbythe95%confidenceintervals/ Contaminatedanddirty operationsare 6.36timesmorelikelytogetinfectedthancleanoperationsand theresultsare statisticallysignificant.

Outofthe192cleancasestherewere9(4.96%)minorinfections,

4(2.08%) moderateinfections and1(0.52%) severeinfection.Outof71clean contaminated cases,4(5.63%)weremildand4(5.63%)weremoderate infections.Inthecontaminatedanddirtycategory,outof75casestherewere

14(18.67%) mildinfections,3(4%)moderateinfectionsand8(10.67%)

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severe infectionsincludingaburstabdomenas showninTable.11.

Table.4 :Showing thedegree ofwound infection in relation to the natureofsurgery.

It is observed that the majority of wound infections in the clean categoryaremildinfections.Almostall(8 outof 9) of thesevere infectionsin thestudyoccurredinthecontaminatedanddirtycategory.

Thestudyshowedaninfection rateof7.29%incleancases.So,we studiedtoseewhethertherewasanincreaseininfectionratewhentherewas adistantfocusofinfection.

Table.4Showstheinfection ratewithreference totheurgencyof operation.

	Mild	Moderate	Severe	Total
Clan	9	4	1	14
CleanContaminated	4	4	0	8
Contaminated&Dirty	14	3	8	25
Total	27	11	9	

Table.5 :Incidenceof postoperativewoundinfectiondependingon urgencyofsurgery

Urgencyof Operation	Noof infected	Noof uninfected	Total	ODDSRatio (95%C.I)
Elective	23(9.87%) (48.94%)	211(90.17%) (70.57%)	234 (67.63%	1.00
Emergency	24 (21.24%)	88 (78.57%)	112 (32.37%	2.46 (1.31-4.62)
Total	47 (13.58%)	299(86.42%)	346	

Thewoundinfectionrateinelectiveoperations is9.87%whereasthat intheemergency operationsis21.24%(p<0.01).Theincidenceofwound infectionin emergencyis 2.46 times that in elective operationsand the findingissignificantas shownby95%confidenceintervals.

Table.6 :Incidence ofpost-operativewoundinfectioninrelation toage ofthepatients

AgeGroups	Noof infected	Noof uninfected	Total	ODDSRatio (95%C.I)
<30Years	11 (10.68%) 23.40%)	92 (89.32%) (30.77%)	103 (29.77%)	1.00
30-60years	33 (14.47%)	195 (85.53%)	228 (65.9%)	1.42 (0.68-2.94)
>60years	3(20%) (6.28%)	12(80%) 4.01%)	15 (4.34%)	2.09 (0.51-8.58)

Thereisnostatisticallysignificantincreaseintheriskofinfectionwith increaseintheageofthepatients(p>0.05).Thoughoddsratiosuggests that patientsabove60yearsofageare2.09timesmoreatriskofgetting post- operativewoundinfectionthefinding isnotstatisticallysignificantasshown bythe95%confidenceintervals.

Table.7 : Incidenceof post-operativewoundinfectioninrelationto sexofthepatients

Sex	Noof infected	Noof uninfected	Total	ODDSRatio (95%C.I)
Female	11 (15.28%)	61(84.72%)	72 (20.81%)	1.00
Male	36 (13.14%)	238(86.86%)	274 (79.19%)	0.84 (0.41-1.75)
Total	47 (13.58%)	299(86.42%)	346	

Thewoundinfectionrateinmalesis13.14%andthatinfemalesis

15.26%.Thisdifferenceisnotstatisticallysignificant. Thoughtheoddsratio also suggests that theinfection rate inmalesisless thanthatinfemalesthe different isnot statistically significantas shown by the 95% confidence intervals.

Table.8 : Incidence ofpost-operativewound infection inrelation to durationof pre-operativehospitalization

Pre-operative Hospitalization	No of infected	No of uninfected	Total	ODDS Ratio (95% C.I)
1week	10 (7.35%)	126 (92.65%)	136 (58.12%)	1.00
>1week	13 (13.27%)	85 (86.73%)	98 (41.88%)	1.95 (0.83-4.62)
Total	23 (7.83%)	21 (90.17%)	234	

Thepost-operativewound infectionrateinpatientswhowereadmitted forlessthan1week beforesurgeryinthehospitalislessthanthatinpatients whowereadmittedformorethan1weekbefore surgery(7.35Vs13.27).But thedifferenceisnotstatistically significant.Thoughtheoddsratioalso suggests thattheinfection inthelate rgroupis1.95timesthatintheformer groupthe differenceis not statisticallysignificantasshownby the 95% confidenceintervals.

Table.9 : Incidence ofpost-operative wound infection in relation to anemia

Haemoglobin	Noof infected	Noof uninfected	Total	ODDS Ratio (95%C.I)
>13gms%	2(4.35%) (4.26%)	44 (95.65%)	46 (13.29%)	1.00
10-13gms%	11(6.59%) (23.40%)	156 (93.41%) (52.17%)	167 (48.27%)	1.55 (0.33-7.32)
<10gms%	34 (25.56%) (72.34%)	99 (74.44%) (33.11%)	133 (38.44%)	7.56(1.73-32.79)
Total	47 (13.58%)	299 (86.42%)	346	

Thereisanincreaseinincidenceofwoundinfectionwithdecreasein thehaemoglobinlevelofthepatients.Theinfectionrateinnormalpatientsis

4.26%inmoderately anemicpatientsitis6.59%andinse verelyanemic patientsitis25.56%(p<0.01). Thewound infectionrateis7.56timesmorein grossly anemic(Hb<10 gms%) patients than in normal patients. These findingsarestatisticallysignificant.

Table.1 0 : Incidence of post-operative wound infection in relation to diabetes

Diabetes	Noofinfected	Noof uninfected	Total	ODDSRatio (95%C.I)
Nondiabetics	33(10.86%) (70.21%)	271 (89.14%) (90.64%)	304 (87.86%)	1.00

Diabetics	14(33.33%) (29.79%)	28 (66.67%) (9.36%)	42 (12.14%)	4.1 (2.18-7.69)
Total	47 (13.58%)	299 (86.42%)	346	

Post-operativewoundinfectionrateinnondiabeticsis10.86%where asthatindiabetics is33.33% (p<0.01). Woundinfectionrateis4.1times higherindiabetesthannondiabeticsandthefindingisstatisticallysignificant.

Table.11:Incidenceofpost-operativewoundinfectioninrelation theuse of drains

Drains	Noofinfected	Noof uninfected	Total	ODD SRatio (95% C.I)
Notused	13(6.13%) (27.66%)	199(93.87%) (66.56%)	212 (61.27%)	1.00
Used	34(25.37%) (72.34%)	100(74.63%) (33.44%)	134 (38.73%)	5.20 (2.61-10.38)
Total	47 (13.58%)	299 (86.42%)	346	

Post-operativewound infectionrate when drains were not used is

6.13%whereasthesamein25.37%whendrainswereused(p<0.01). The woundinfection rateis5.2timesmorewhendrainswereusedthanwhen drainswerenotusedandthefinding issignificantasshownbythe95% confidenceintervals.

BACTERIOLOGY

Variousorganisms culturedfromthe47woundsareshowninthe table.22.Whenever therewasadischargefromthewound,aswabwastaken andsentformicrobiological examination.Outofthe47woundsthatwere infectedorganismswere culturedon33occasions andcultureswerenegative on14occasions.Thoughcoagulasepositive Staphylococcusaureusisasingle majororganism obtained(11+10),woundinfectionswerepredominantly causedbymixedflora. This showsthechanging patternofinfection towards mixedinfections.

Table.12:Micro-organismsculturedfromthe47infectedwounds

Organisms Cultured	Number
CoagulasepositiveStaphylococcusaureus	11
CoagulasepositiveStaphylococcusaureus+E coli	5
E Coli+Klebsiellasp.	5
CoagulasepositiveStaphylococcusaureus+Klebsiellasp.	3
Klebsiellasp.	3
E.coli+Pseudomonassp.	2
Pseudomonassp.	2
CoagulasepositiveStaphylococcusaureus+Pseudomonas sp.	2
Noorganismcultured	14

DISCUSSION

Causesof post-operativewoundinfectionare multifactorial, determined bytheinteractionofseveralfactors:thenatureanddegree of contaminationofthewound,localtissuefactorsandthegeneralresistanceof thepatientprobablymodified bytherapeuticmeasures. Variousfactorsboth intrinsicandextrinsictothepatienthavebeenincriminatedtowoundsepsis. Afewof themare consideredinthis study.

Incidenceofinfection

Theoverallinfectionrateinthis studywas13.58%whichappearstobe veryhigh.Suchalargefigureisparticularlyduetohigherinfectionrateinthe contaminated anddirtyoperativeprocedurescategory(33.33%).Asthe nationalmedicalcouncil(1960)[56] hasrightlypointedout,certainoperative procedureshaveahigherpropensityforinfectionwhiletheothershavea lesserpropensity.Whenanaccuratecomparision ofresultshastobeaudited, "likemustbecomparedwithlike".Aftersegregationofoperativeprocedures intogroupstheinfectionratesareasshownin.Theinfectionratesin thecontaminated anddirtyprocedurecategoryarecomparablewiththoseof Cruse[6]andFoord. Theinfectionratesinthecleanproceduresarecomparable withthoseofHalletal[83] ,Plattetal.,andEvans [8] .Manyauthorsbelievethat theinfectionratesincleanoperativeprocedurescanbebroughtdownto below1%withtheuseoflamellarairflowsystems,bodyexhaustsystems andtheuseof prophylacticantibiotics.

Theinfection rateinthishospitalhasremained constantataround7% overtheyears.Thiscanbeexplainedconsideringthefactthatthemostofthe patientsareanemicwithahighersusceptibility toinfection.Thisbeinga teaching hospital,thetheatresareoften crowdedwithmedicalandnursing studentsprovideahigherchanceofcontamination. Thisalongwithimproper theatreventilation increasesthechanceofwoundinfection.Attimeslong operation listsgoonwithverylittletimebetweentheoperativeprocedures. Kleinertetal do not agree with this presumption. They hadan overall infectionrateof1.5%operatingindoubleoccupancyoperatingrooms. Hot andhumidconditions,poornutritionalstatusoftheIndianpatientsmakes themevenmoresusceptible forwoundsepsiscomparedwiththewell nourishedwesternpatients.

Micro organism:-

Most common organism encountered in our study is staphylococcus aureus,the second most common organism was e.coli

TABLE 13

Kowly and et all shows a predominos of staphylococcus species and our values matches with obsevravtions by kowly et all Surgery(emergency,elective):-

author	Agarwal and et all [87]	Kowly et all [88]	Tripathy and roy[89]	Our study
organism	e.coli	staph	proteus	staph

In the present study the number of cases with post operative wound infection in elective surgeries are 23 out of a total number of 234 elective surgeries accounting to 9.87% and for emergency surgeries are 24 out of a total number of 112 emergency surgeries accounting to 21.24%

TABLE 14

author	Gill ega et all	Our study
No of elective cases operated	3842	234
%of cases infected	2.9%	9.87%
No of emergency cases operated	623	112
%of cases infected	5.1%	21.24%

Gill Ega et all study shows that 623 patients were operated as emergency surgery with a wound infection rate of 5.1% versus 3842 patients were operated as elective surgery with wound infection rate of 2.9%,so this study results matches with our study which shows post operative wound infection rate more in emergency surgeries

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Type of surgery:-
TABLE 15

Type of operation	Cruse and foord 59	Agarwal et all 87	Tripathy and roy 89	Our study
clean	1.8%	36.17%	30%	7.29%
Clean contaminated	8.9%	57.14%	25%	10.13%
Contaminated and dirty	59.8%	100%		33.33%

In the present study the percentage of wound infection rates for clean, clean contaminated and contaminated and dirty wounds is 7.29%, 10.13%, and 33.33% respecxtively. The results of cruse and foord and agarwal and et all matches with our study which shows invrease in wound infection with increasing contamination

PATIENTDEPENDENT FACTORS
AGEOFTHEPATIENT
Infection ratesarehigherattheextremes ofage withapeak over65 years.Thoughtheinfectionrateinabove60yearsgroupsis2times(Odds +++ratio=2.09)higherthanintheyoungeragegroupsthis isnotstatistically significant.Asthenumberofpatientsinabove60yearsagegroupisonly15, alargerstudymayshow asignificantdifference.

Thedifference ininfection ratewithagemightbeduetosomeother factorotherthanageitself.Forexamplethegeneralcondition ofthepatient, metabolicdiseasesare commonintheolderagegroup.

TABLE 16

Author	No of patients	No of SSI	result
Byrne et all [90]	3466	582	Increase in proportion of infection with increase in age
De boer et all [91]	4872	55	Risk of infection increases with age with peak above 60 yrs
Scott et all [92]	9016	1133	Risk of infection increases with age
Malone et all [93]	5031	162	Age did not predict wound infection
Pessaux et all [94]	4718	191	Age did not predict wound infection
Our study	346	47	Infection rates are higher at extremes of age with a peak over65

SEXOFTHEPATIENTS
Manystudieshaveshown ahigher infectionrateinmalescomparedto females.Femaleshavebeenobservedtohavehormonal andcellmediated responsescomparedtomales.Hightestoroneandlowoestrogenlevels wereinstrumentalin immunesuppressionfollowingtrauma inrodentmodels. In this study maleshad a lesserinfection rate (Oddsratio = 0.84) than females.Thisdiscrepancyisstatisticallynotsignificantasthetotalnumberof femalesinthe studywereonly72(Vs274males).A largerstudywould have astatisticallysignificantdifference.

ANEMIA
The relation between anemia and incidence of wound infectionis shownintable.18.

Anemiaincreasestheinfection ratethroughhypoxiaandbyderanged tissueperfusion.Thoughmalnutrition andanemiaareincriminated foran increasedinfectionrate,notmanyliteratureclearlys ubstantiates thefact. InfectionrateinpatientswithHaemoglobin above13gms%was4.33%with haemoglobinbetween10and13gms %itwas6.59%(Oddsratio=1.55)and inpatientswithlessthan10gms %itwas25.56%(Oddsratio=7.56).These values arestatistically significant showing a strong association between anemiaandpostoperativewoundinfection.

DIABETES
Diabeticpatientsaremoreproneforinfections thannondiabetic patients.Theinfluenceofdiabeteswouldbeconfoundedbyincreasing age, presence of aseptic focus, generalized debilitation and increased pre- operative admission. Studieshaveshownthattheinfection ratesarehigherin uncontrolleddiabeticswithketoacidosis. In a study by Dr. Clare heal and jame cook identified that patients with diabetes had a higher risk of post operative wound infection

Inthisstudytheinfectionratesindiabeticsandnondiabeticsisshown inTable.19.Theinfectionrateindiabeticswassignificantly higher(33.33%) than nondiabetics(10.86%). This difference was statistically significant (Oddsratio=4.1).

SURGEONDEPENDENT FACTORS[6,8,56]
PRE-OPERATIVEHOSPITALISATION
Pre-operativehospitalizationhas asignificant impact on the post- operativewoundinfection.Asthedurationofpreoperative hospitalization increases thenormalbacterialfloraofthepatientwillbereplacedbythe resistanthospitalflora. Hencethedurationofpre-hospitalization increases post-operativewoundinfectionrate.

Inthisstudythoughtheinfection ratewashigherwhenthepre- operativehospitalization wasmorethan1week(13.27%)thanwhenthepreoperativehospitalizationwaslessthan1week(7.35%)withanoddsratioof

1.95thefindingsarenotstatistically significant.Cruseand-Foordhadan infectionrateof1.2%withonedaypre-operative hospitalstay;2.1%with1 week hospitalstayand3.4%withmore than2weeksofpre-operative hospitalization.

DURATIONOFOPERATION
Thereisadirectrelationship betweenthelengthoftimeofoperation andtheinfection rate.Theinfection rateroughly doubles withevery hourof surgery.Inthisstudytheinfection ratesinrelationtodurationofsurgeryis shownintable.10.Intheoperativeproceduresslessthan2hoursduration thereisnosignificantincreaseintheincidence ofinfection.Inprocedures exceeding 2hoursoftimethereisastatisticallysignificantincreaseinthe infectionrate(Oddsratio=8.24).

USEOFDRAINS
CruseandFoordfoundthatuseofdrainsisassociated with-higher infectionrate. Porras – Hernandez et all showed in their study that use of open drains was associated with surgical site infections. Thisstudy alsoconfirmedthatthereisan increaseincidenceof woundinfectioninoperations wheredrainswereused(25.37%)when compared tooperationswheredrainswerenotused(6.13%).Thoughthis findingisstatistically significant(Oddsratio=5.20)drainswereusedmainly indirtyandemergency operativeprocedures,whichareby themselves associated with higher infection rate. Hence it is difficult to point to thedrains as acause for infection.

CONCLUSIONS
1. Theoverallinfectionrateinthisstudywas13.58%whichismainly due to the higher infection rate in the contaminated and dirty procedures(33.33%)wheremanyofthepatientswerefirstseenabout 2to3daysafterperitonitishaddeveloped.
2. Theinfectionratewashigherintheemergencyoperativeprocedures (21.24%) when compared to theelectiveprocedures(9.87%).
3. Femaleshadaslightlyhigherinfectionrate(15.28%)whencompared tomales(13.14)butthedifferenceisnotstatistically significant.This couldprobablybebecauseofsmallnumberoffemalesinthestudy(72 vs274).
4. Infectionratewashigheramongpatientsover60years(O

.R.=2.09) andinpatientswithpre-operativehospitalization over1week (O.R.=1.95)thoughthereisnostatisticalsignificance.

5. Thisstudyestablishedtheinfluenceofnatureofsurgery,urgency of surgery,duration ofsurgery,anemia,diabetesanduseofdrai nsonthe incidenceof infectionwithastrongstatisticalassociation.
6. Thisstudyclearlydepictedthechangingpatternofwoundinfection towardsmixedinfections.
7. Alargerstudywithasubstantialnumberofpatientswillconfirmthe findingsinthisstudy.

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