

# Prophylactic Pre-Operative Broad Spectrum (Extended Spectrum) Antibiotic for Elective Cesarean Section in a Low Socio-Demographic Society

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## Abstract

**Background:** the use of routine prophylactic antibiotics substantially reduces the rate of post cesarean section infection. **Aim:** to test the efficacy of 2 gram of ceftriaxone as single dose pre operatively as extended broad spectrum antibiotics in prophylaxis against post Cesarean section infection in elective operation in low socio economic society. **Subjects and Methods:** Our study is pilot clinical trial done in Hadhramout government in Yemen to detect the percentage of infection post Cesarean section after use of prophylactic dose of 2 gram of ceftriaxone as single dose pre operatively and relation of base line criteria and surgical character in this regime of prophylaxis. **Results:** One hundred women were involved in the study and received the prophylactic dose of ceftriaxone pre operatively half an hour to one hour before Cesarean section and base line character involving, age, BMI parity, number of previous Cesarean section, indication for Cesarean section, duration of surgery, type of anesthesia, details infection if occurred post Cesarean section, maternal side effect, and any neonatal complication. The percentage of infection after prophylactic dose was 4% and the risk factor was increase of BMI and repeat Cesarean section in 50% of cases without any maternal or neonatal side effects. **Conclusion:** Use of extended broad spectrum antibiotics was effective in decreasing soft tissue infection post elective Cesarean section and another study is needed to compare the use of different regime of broad extended spectrum in either elective or emergency operation.

**Key words:** wound infection, broad spectrum, extended spectrum antibiotics.

## Introduction

Cesarean section rate are increasing rapidly in the last decades and indications for it also increased rapidly and society and community in Yemen especially in south areas where facilities are little are difficult to tolerate the increase infection rates. The use of routine prophylactic antibiotics substantially reduces the rate of post cesarean section infection<sup>(1)</sup>. In developing countries the overall rate is around 12% but differ widely by region (0.4-40%)<sup>(2)</sup>. Without prophylaxis,

the incidence of endometritis is reported to range from 20% to 85%; rates of wound infection were about 25%<sup>(3)</sup>. The commonest item in Cesarean section complications is wound infection and also other infectious morbidity which is less common but more serious like endometritis, urinary tract infection, pelvic abscess, necrotizing fasciitis and septic pelvic vein thrombophlebitis. Occurrence of infection lead to financial over burden especially prolonged hospital stay sometimes these can lead to maternal mortality<sup>(3,4)</sup>. Although prophylactic antibi-

otics have been shown to reduce the incidence of postoperative infections morbidity after cesarean delivery, the most effective regimens and timing of administration have not been established, some has suggested antibiotic prophylaxis only for emergency cesarean section and others demonstrated that prophylactic antibiotics were effective and decrease of financial burden in all cesareans, elective and emergency<sup>(5)</sup>. One systemic review examined the efficacy of prophylaxis in elective and non-elective procedures, and concluded that prophylaxis has a strong protective effect for all types of caesarean section<sup>(6)</sup>. Details of different regimens of antibiotics for prophylaxis at cesarean section have been compared<sup>(7)</sup>. There were adverse effects of antibiotic which include gastrointestinal symptoms (nausea, vomiting or diarrhea), skin rashes, thrush (candidacies, which can affect both mother and baby) and joint pain<sup>(8)</sup>. Infant outcome were infrequently reported in previous studies.

## Subjects and Methods

### *Methodology, philosophy of the study and aim of the work*

The importance of giving prophylactic antibiotics for Cesarean section in prevention of great morbidity a of post operative infection and wound infection which is considered big health and financial burden in our locality of decreased recourses and decreased follow up of the patient due to big distance between patient stay and health care provider. As there is big controversy as mentioned before about the time and regimen of antibiotic as some recommended use of antibiotics by intra venous route half an hour to one hour before an operation to maximize antibiotic effect but has controversy that it is better to be given after cord clamping to avoid resistant strain in the neonate in pre operative use but

many studies as mentioned before had no neonatal hazards and also use of antibiotics in PPROM has no hazard in spite of it extended spectrum .Controversies are still about the time but last evidence support pre operative use as was done in our study. The regimen varies from narrow spectrum like cephalosporins before operation i.e. before cord clamping or use of broad spectrum or extended spectrum after cord clamping. Our study will collect use of broad (extended spectrum) two gram of ceftriaxone intravenous either directly or at the intravenous normal saline giving as pre load 30 to 60 minutes before elective Cesarean section and we used this regimen before an elective Cesarean section to equal the risk factor of base line infection as use of prophylaxis in urgent and elective of a different indications will result in unequal result and assay. The entire patient did not take antibiotics the 2 week before the operation nor had soft tissue infection. Some additional notes about this regimen in that routine follow up or recording of temperature following Cesarean section or recording it as sign of febrile morbidity was not done as in it can lead to confusion as it is in the most cases fever was due to breast engorgement which is very common after Cesarean section and also may be a sign of other infection in other body system like chest infection..No need for culture and sensitivity pre or post operative as most studies did not recommend it, also our Cesarean section are elective one and not of high risk of base line of infection and no risk factor present as we excluded all risk factor or complicated Cesarean section like D.M, pre-eclamptic cases, possibility of bleeding tendencies also all emergency Cesarean section are excluded. Side effects of antibiotics was recorded during or immediately Cesarean section. Verbal and informed consent was obtained from every women involved in the study.

## Methods

The study was done at EL-Mukala maternal and child hospital and Hadhramout maternal and child university hospital in a period from July-2014 to January 2015. This was an observational prospective clinical study involving 100 patient recruited for elective Cesarean section with different indications. All Cesarean section were done under complete aseptic condition as recorded in international guidelines. Sheet for collecting of data was done and will involve base line criteria as age, BMI, parity, number of previous Cesarean section then observer during operation recorded duration of Cesarean section in minutes, type of anesthesia and indication of elective Cesarean section which involve one the following indications. 1) Previous Cesarean section, 2) Cesarean section on demand, 3) Breech either single or twins, 4) Infertility, 5) Fetal compromise. Recorded side effects either during Cesarean section or immediately after Cesarean section were done, follow up for signs of infection which was classified into internal signs of infection and external signs of infection. *Internal signs of infection* were: 1) Offensive and purulent lochia, 2) Tender uterus within 10 days, 3) Signs of urinary tract infection like dysuria, burning, frequency with or without supra pubic pain. *External signs of infection* were 1) Redness and excessive swelling in the wound, 2) Throbbing pain with or without tenderness in the wound, 3) Pus or watery discharge collected beneath or drained from the wound. Wound healing duration in days: was recorded. Any adverse neonatal outcome: was recorded. The follow up was at early visit after 3 days followed by 4 visit one every week but should be immediately in presence of any complications involving infection. Cares of wound involve sterile dressing in early visit and dressing the wound by povidine iodine solution but

without dressing in absence of complications after one week. After completing the study and complete collection of data statistical analysis was done involving assessment of the base line criteria using SPSS version 16 to get the following outcome: Number, mean, standard deviation, standard error, range, minimum and maximum of the: age, BMI, parity, number of Cesarean section, duration Cesarean section in minutes, Percentage of different types of anesthesia Percentage of each indication of Cesarean section, Complete description of every infected case by its base line characters, indication of Cesarean section, duration of surgery and duration of wound healing and type of infection. Maternal side effects during operation or immediate post partum and any recorded side effect in the neonate. Informed consent for every participant after acceptance of ethical committee of faculty of medicine in Hadhramout University was done.

## Results

The study was done at El-Mukala maternal and child hospital and Hadhramout maternal and child university hospital in a period from July 2014 to January 2015 under complete aseptic condition and the base line criteria was: mean age was  $27.10 \pm 5.3$  years, mean BMI was  $26 \pm 2.38$ , mean parity was  $1.27 \pm 1.37$ , and the mean number of previous Cesarean section was  $0.78 \pm 1.02$ . Mean duration of wound healing was  $7.57 \pm 1.6$  days. All cases were done under spinal anesthesia (Table 1). The indications of Cesarean section were as follow previous Cesarean section 33%, fetal compromise 31%, infertility 14%, Cesarean section on request 12% and Cesarean section for breech was 10% (Table 2). As regarding incidence of infection there was 4 cases of post Cesarean section infection (4%) percentage and detailed analysis of this infection was shown

in table (3). Wound infection was recorded in three cases; two cases in the form of pus discharge coming from the wound, and

one was throbbing, tender wound. These three were external signs of infection.

**Table 1:** Basic Data of the study population

	No.	Mean	SD	SE	Range	Min.	Max.
Duration of C.S. (minutes)	100	34.66	9.537	0.954	50	25	75
No. of previous C.S	100	0.78	1.021	0.102	3	0	3
Parity	100	1.27	1.370	0.137	7	0	7
BMI( kg/m <sup>2</sup> )	100	26.60	2.383	0.238			
Age (yrs)	100	27.10	5.308	0.531			
Wound healing duration (days)	100	7.57	1.659	0.166	14	6	20

CS= Cesarean section, BMI= body mass index, SD=standard deviation, SE=standard error

**Table 2:** Cesarean section Indication in the studied women

Indication of Cesarean section	No.	%
Fetal comprise	31	31
Infertility	14	14
Request	12	12
Breech	10	10
Previous Cesarean section	33	33
Total	100	100

The fourth case was tender uterus which is internal sign of infection. Two cases were having increased BMI more than 30 (kg/m<sup>2</sup>) which was considered a risk factor. Duration of surgery was slightly prolonged up to 75 min which was related to the difficulty of the operation, also accompanied by previous scar could increase difficulty due to possible adhesion. Indication of Cesarean section had no role as all cases were done in elective manner (no emergency). As in other two cases of infection fetal compromise was the indication for but fetal compromise meaning decreases biophysical profile or non reactive non stress test which was not acute accident or emergency. No recorded maternal side effect during the operation or in the immediate post operative period. No recorded side effect in the neonates within 15 days post partum neither thrush nor severe resistant infec-

tion. As regarding management of the infected cases no culture and sensitivity was done but broad spectrum antibiotics covering gram negative, gram positive and anaerobes and frequent sterile dressing of infected wound until complete resolution of infection and complete healing of the wound.

## Discussion

Cesarean delivery is the single most important risk factor for postpartum infection. Compared to women delivered vaginally, those delivered by cesarean classically face a 5 to 20-fold increase in risk<sup>(4)</sup>. In our community the CS rates are lower than vaginal delivery; therefore we highly recommend the prophylaxis pre-operatively to avoid infection which is very high in comparison to vaginal delivery starting in elective CS which contributes to high percentage from all number of CS. These associated infections are accompanied with marked health and economic burdens. Low socioeconomic status and obesity were among these risk factors for post-cesarean infection<sup>(9)</sup>. Routine use of prophylactic antibiotics decreases the risk of post-cesarean infections by over 50%<sup>(10)</sup>.



**Table 3:** Details of every case of infection

Indication	Age	BMI	Parity	Past C.S	Surgery time min	# signs infection	Infection Type	healing Duration (days)
- Previous C.S	35	37	3	Yes	75	1	Tender uterus	14
- Breech	33	35	2	Yes	70	1	Throbbing and Tender wound	10
- Fetal compromise	28	27	0	No	27	1	Pus discharge from wound	10
- Fetal compromise	19	23	0	No	27	1	Pus discharge from wound	20

Because antibiotic prophylaxis decreases overall length of hospitalization and treatment financial burden associated with cesarean, it is highly cost-effective<sup>(11)</sup>. In our study we are recommending to use antibiotic prophylaxis to counteract against infection especially in presence of low socio economic level and presence of obesity which constitute 50% of infected cases and also will shorten the hospital stay and cost of care of infected Cesarean section wound and infection in general. Regarding duration of cesarean section it was found that in one of previous studies majority of women their operation was ended within (31-60) minute<sup>(12)</sup>. Another study showed that majority of women (62%) their operation finished in a time less than 90 minutes<sup>(13)</sup>. In our study the mean duration of Cesarean section was 35 minutes and the minimum is 25 minutes and the maximum is 75 minutes which is near to the previous studies. It was demonstrated that the risk of postoperative wound infection was considerably reduced when the operation time was short. In the course of prolonged operation, there was significant tissue destruction resulting from tissue handling and reduced tissue perfusion<sup>(14)</sup>. In our study 50% of infected cases, the duration is from 70 to 75 minutes which may be related to high body mass index in these two cases. Concerning the indications of cesarean section, it was found that, the previous two or more cesarean sections was about (24%) as a primary indication of cesarean section,

17% for previous caesarean section and post date, and 7.5% for previous cesarean section and decrease oligohydraminous<sup>(12)</sup>. In our study the most common indication for Cesarean section was previous scar 33% followed by fetal compromise 31% infertility 14%, Cesarean section on request 12% and Cesarean section for breech was 10%. Which agree with the previous study. In one study, it was found that all cesarean section operations performed to the women under spinal anesthesia except 5 women that their operations performed under general anesthesia<sup>(12)</sup>. In our study all cases were done under spinal anesthesia and this difference from previous studies reflects the more safety of spinal anesthesia in recent years. In our study we did not use the increase of temperature as parameter of infection as it can be related other source of infection even in presence of soft tissue infection like upper respiratory infection or other system infection. One of the studies on the timing of pre-operative antibiotics for cesarean delivery concluded that there was strong evidence that antibiotic prophylaxis that is given before skin incision decreases maternal infectious complication<sup>(15)</sup>. In women undergoing either elective or non-elective cesarean section with absence of signs of infection before the operation, the use of prophylactic antibiotics has been shown to reduce the risk of endometritis by two thirds to three quarte-

rs<sup>(16)</sup>. In our study the incidence of infection with use of pre operative 2 gram of ceftriaxone was 4% which was better than these studies and had a character of single shot dose without addition for other days. Use of extended-spectrum regimens (i.e., a regimen involving the use of both the standard narrow-spectrum antibiotic in addition to a second antibiotic of a different class e.g. azithromycin,) are significantly more effective in reducing post-cesarean infections by 30–60% and shortening hospital stay and costs than narrow-spectrum agents alone<sup>(17)</sup>. In the previous study the Cesarean sections were combined elective and urgent but we are in need for further comparison of extended spectrum antibiotic involving more than one drug specially azithromycine to single dose of 2 gram of ceftriaxone both in elective and emergency Cesarean section. In comparison in many previous studies it was found that pre-precision administration will expose all neonates delivered by cesarean to prenatal antibiotics. The already widespread prenatal use of antibiotics for preterm membrane rupture and to prevent GBS sepsis (both of which are without demonstrable neonatal harm), may serve to diminish concerns regarding safety<sup>(18)</sup>. In our study no record of any neonatal side effect which was good news and agree with the previous studies. One of the studies regarding maternal side effects found that those three patients suffered vomiting and one patient (1%) in the Ceftriaxone group developed a maculopapular skin rash; this occurred immediately after drug administration and resolved spontaneously without treatment<sup>(19)</sup>. No maternal side effect was reported in our study which was related to the use of single dose in our study. Our research studies an area of conflict regarding the use of antibiotics (extended) broad spectrum in the prophylaxis against post operative infection in cesarean section. The use of 2 gram

of ceftriaxone (ceftriaxone) [tabouk industry] preoperatively markedly reduced post cesarean section infections. This was most effective in women with low socioeconomic background like in Hadhramout/Yemen where post cesarean section infections constitute a big financial and health burden.

## Conclusions

The use of extended broad spectrum antibiotics is effective in decreasing soft tissue infections in post elective Cesarean section. Further studies are needed to compare the use of different regime of broad extended spectrum in both elective and emergency Cesarean section.

### Conflict of Interest

No conflict of interest between authors as there is only single author. No financial or commercial relationship between the author and the pharmaceutical company whose antibiotic used in this study in the last 12 months or before

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