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Analysis of maternal vaginal microbes and its influence on oral cavity of newborns in various modes of delivery viz., spontaneous vaginal, induced delivery, cesarean section

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Abstract
Aims: Observation of microbes transference from mother's birth canal to neonatal oral cavity during various birth delivery modes in term gestation with intact membranes.
Materials and Methods: 100 healthy pregnant women selected for study were divided into five groups each comprising 20 subjects. the delivery modes studied were spontaneous vaginal [Group 1], induced delivery [Group 2], assisted vaginal delivery, forceps/vacuum [Group 3] emergency cesarean [Group 4], elective caesarean [Group 5]. High vaginal swabs obtained before delivery, whereas neonatal buccal cavity sample were obtained soon after delivery. Samples were transported to the lab for microbiological assays and statistically analysed using Chi-Square test.
Results: The association of transference of microbes between parturient canal and oral cavity statistically significant for spontaneous, induced deliveries and emergency cesarean deliveries.
Conclusion: Irrespective of birth delivery mode neonate's buccal cavity was contaminated by microorganisms.

Keywords: High vaginal swab, microbes, mode of delivery

Introduction
The vaginal flora in term pregnancy and at onset of labour consist of following organisms 1) *Doderlein bacillus* 2) Yeast like fungus with increased prevalence of *Candida albicans* 3) *Staphylococcus albus* or aureus 4) *E. coli* and *Bacteroides* group 5) *Clostridium welchii*. Vaginal microflora is a complex ecosystem having diversified species of *Lactobacillus* and other microbes. As a result of decrease in Lactobacilli species, increase in pH of vaginal secretion result in lactobacilli having replaced with pathogenic gram negative anaerobic bacteria such as *E. coli*, gardenella vaginalis, *Mycoplasma hominis* and *Mycoplasma*, *Bacteroides* [1-2]. Newborn acquires mother's microbiome from birth canal during delivery process and these bacteria colonize in the gut, it has been identified that the delivery mode is a significant factor influence the colonization and composition of intestinal microbiota. In this study possibility of the maternal microflora being transferred to neonate during birth analysed in different birth modes (spontaneous vaginal delivery, induced delivery, assisted vaginal delivery [forceps, vacuum], Cesarean [elective and emergency]) [3]. Neonatal bacterial diversity was highest at birth in oral and anal sites declined by third day. Furthermore Particular body sites (mouth, skin) more amendable to inoculation. So in our study we took high vaginal swab of antenatal mothers in term gestation and oral swab of neonate immediately after birth and observed for microorganism transfer from pregnant women birth canal during various delivery modes [4-5].

Aims and objectives
1. To compare microflora of mothers just before delivery and oral microflora of neonate immediately after birth.
2. To compare microbes obtained from mouth of neonate at birth born via vaginal delivery (spontaneous, induced, assisted) and Cesarean delivery (elective and emergency).

Materials and methods
This study conducted in Obstetrics and Gynaecology Department of RMMCH, Annamalai University after obtaining ethical clearance.

This was a descriptive study in which newborn's oral cavity was observed for microorganism transfer from pregnant women's birth canal during various delivery modes. In this study we selected 100 term antenatal women with no history of antibiotic usage. PROM, Multiple gestation, GDM, premature pregnancies excluded from the study.

The procedures, discomforts, risk and benefits explained fully and informed consent for the study was obtained from families of pregnant women [9].

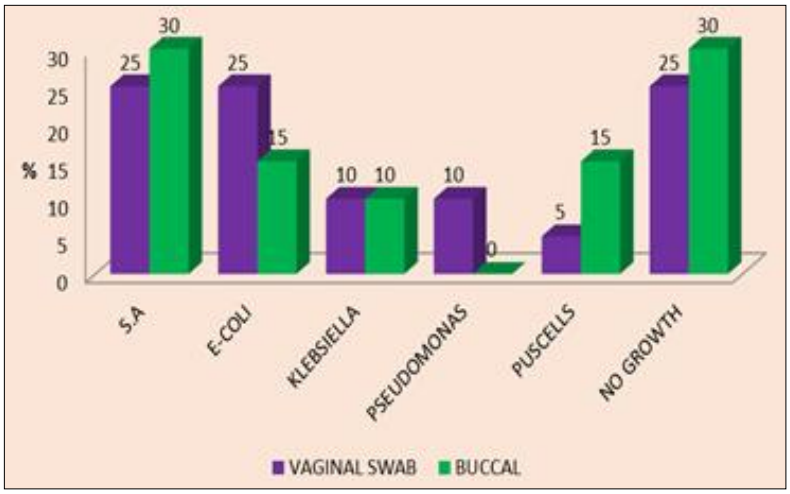
Parturient canal sample was obtained from 100 pregnant (term gestation) subjects. A sterile cotton swab was used to obtain vaginal material from vagina and just before delivery. Oral cavity samples obtained immediately following infants birth. Sterile swab were rotated from cheeks, buccal sulci and edentulous ridges, tongue and hard palate were uniformly samples with single swab obtained using wooden stick. This was transported to microbiological laboratory analysis.

Microbiological procedures

The glass slides with the smear were stained with gram's stain and microscopically observed for organism morphology the specimens inoculated in the 5% glucose broth were then placed in the incubator for 18 -20 hours and then inoculated into the blood agar and Mcconkey media. The media were incubated for 18-24 hours after 24 hours the culture media were observed for growth. The colonies were further processed for subculture a further biochemically reaction was performed to confirm the identity of the organisms.

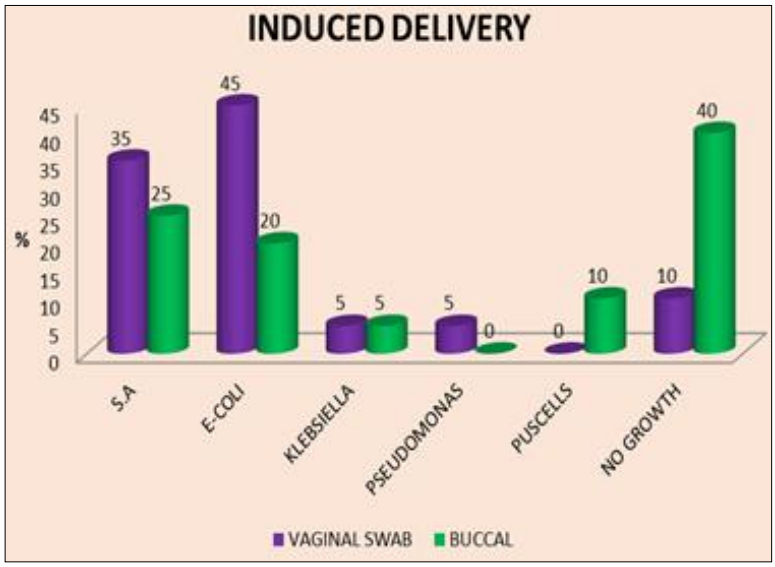
Data analysis and results

In present study, microbs of vaginal swab and oral cavity is compared. The comparison is done for overall findings and individually for 5 different modes of delivery viz; spontaneous induced assisted elective and emergency caesarean. The transference rate of microflora is analysed by chi-square test of associated between vaginal and buccal finding a total of 100 women's was included and they were decided into five independent categories according to this mode of delivery. The entire statistical is carried out using statistical package of social sciences (sprs-21).



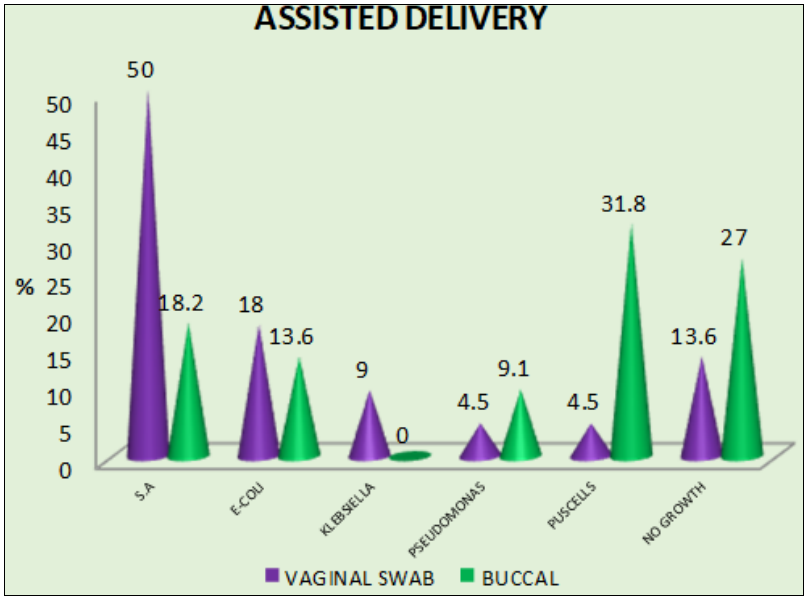
Group 1: Comparison of microbes between birthcanal and oral cavity in spontaneous vaginal delivery

The Staphylococcus aureus was found in 25% in vaginal swab whereas it was observed in 30% in buccal cavity. *E. coli* was observed in 25% in vaginal swab and 15% in buccal cavity. The transference of Staphylococcus aureus was 80% to oral cavity. The transference of *E. coli* was 60%.klebsiella transference was 100%.Pus cells transference was 100%.The Chi-Square test of association is statistically significant (P=.001).



Group 2: Comparison of microbes between birth canal and oral cavity in induced delivery

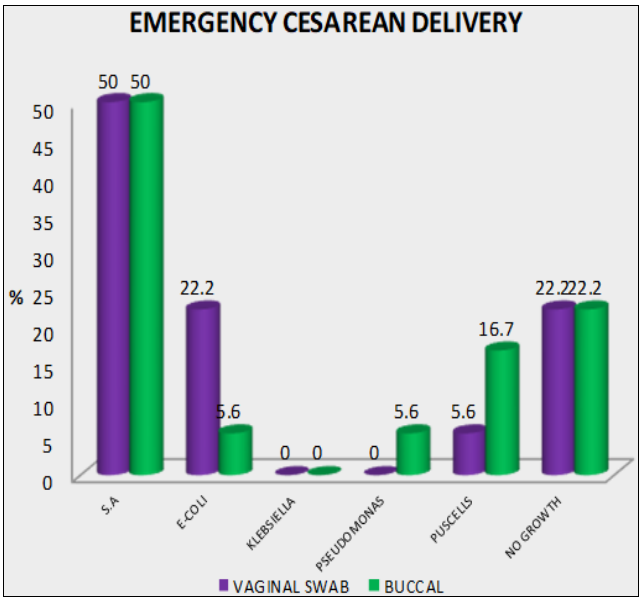
In Group-2 Staph aureus was found in 35% in vaginal swab and 25% in buccal cavity. *E. coli* was found 45% at vaginal swab and 20%in oral cavity. The transference of *Staph aureus* was 57.1%, *E. coli* was 33.3%. Klebsiella was 100%. The Chi-square test of association is statistically significant (P=.006).



Group 3: Comparison of microbes between birth canal and oral cavity in assisted delivery

Staph aureus was found in vaginal swab (50%) and 18.2% in buccal cavity. *E. coli* was found in 18% in vaginal swab and 13.6% in oral cavity. Pus cells found in 45% in vaginal swab and 31.8% in oral cavity.

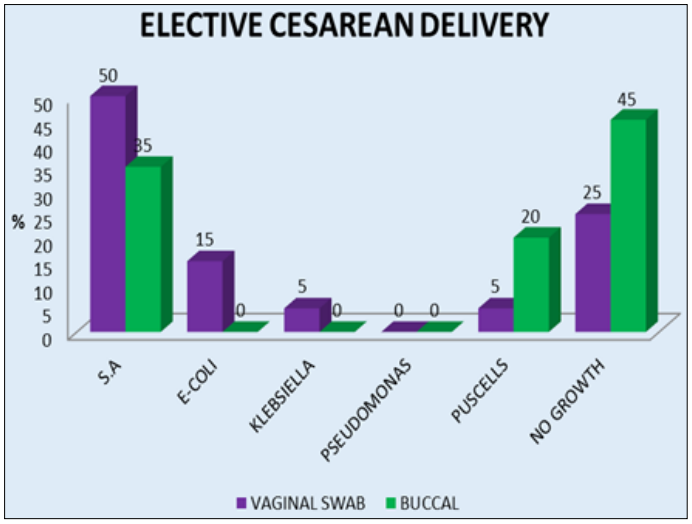
The transference rate of Staph aureus was 27.3%.The *E. coli* WAS 25%. The Chi-Square test of association is statistically insignificant (P=.13).



Group 4: Comparison of microbes between birth canal and oral cavity in emergency ceasarian delivery

IN Group-4 Staph aureus found in 50% in vaginal swab and 50% at buccal cavity. *E. coli* was found in 22.2% in vaginal swab and 5.6% in buccal cavity pus cells was found in 5.6% in vaginal swab and 16.7% in buccal cavity no growth was found in 22.2% in both vaginal and buccal examinations.

The transference of *Staph aureus* was 77.8% and no growth association in 75%.The Chi-Square test of association is statistically significant (P=.001)



Group 5: Comparison of microbes between birthcanal and oral cavity in elective caesarea section

In Group-5 Staph aureus was found 50% in vaginal swab and 35% in buccal cavity. *E. coli* was found only in vaginal swab (5%). Pus cells was 5% in vaginal swab and 20% in buccal cavity. The association of Staph aureus was 60%. No growth was 100%. The Chi-Square test of association was statistically insignificant (P=.06).

Discussion

The normal microbes of the vagina include staphylococcus aureus, staphylococcus epidermidis, group B streptococcus, enterococcus, gardenella vaginalis, *Peptostreptococcus*. In this study, the microorganisms isolated from antenatal women birth canal before birth were staphylococcus aureus, *E. coli*, Pseudomonas, Klebsiella; in addition pus cells were found. The microorganisms reported in oral cavity of newborn include Staphylococcus aureus, *E. coli*, Klebsiella, pseudomonas; in addition pus cells [6]. A Similar study was done by Panesear (1997) [11]. In our study Staphylococcus was the common

organism found in 42% in maternal high vaginal swab and 31% in oral cavity of new born. The next common organism was *E. coli* found in 25% at high vaginal swab and 11% in oral cavity. Pus cells in high vaginal swab was only 4% whereas it was 19% in buccal cavity. No growth of bacteria was 19% in high vaginal swab and 33%in oral cavity [7].

Overall association of bacteria between birth canal and oral cavity shows that Staphylococcus had 57.1% association that is 57.1% of transference of staphylococcus aureus in buccal cavity of newborn was found. The transference of *E. coli* was 28%. The transference of Klebsiella and pus cells in oral cavity was 50%. The oral cavity of newborn was least sterile in emergency caesarean deliveries (22.2%). Apart from group-1, transference of staph aureus, *E. coli*, Klebiella, pseudomonas, were low numbers in neonate mouth compared with birth canal. In vaginal deliveries (Group 1, 2, 3) mother‘s vagina could have been the source of these microbes for the newborn. A similar study reported by Hedge (1998) [8] Tones-Alipi (1990) [12], Mander (1996) [13] In elective ceasarian Babies born via Elective C-section could have acquired infection by skin contact, hospital equipment.

In this study, Microbes transference from birthcanal to oral cavity of newborn could have occurred in emergency C-sections which are done after failed induction, non-progress of labour due to repeated pelvic examinations. Similar study done by Maria G. Dominguez-Bello [10].

Conclusion

The following conclusions were drawn from this study.

- Majority of antenatal birth canal was contaminated.
- In all birth modes oral cavity of newborn was contaminated by one or other micro organism.
- Total or 100% sterile oral cavity was not observed in any of delivery mode. The oral cavity of newborn least sterile in emergency ceasarian deliveries; most sterile in elective ceasarean followed by induced deliveries.
- A greater number of birth canal-oral cavity pairs showed the presence of staphylococcus, Klebsiella & pus cells. In vaginal deliveries mothers vagina could be the source of these microorganisms for neonate. In elective caesarean deliveries since acquisition of the microbs through the birth canal eliminated, as the birth is via the abdominal route. Otherwise these c section babies could have picked their bacteria either from skin contact or from hospital environment.
- Microbes transfer from birth canal to oral cavity of newborn can occur in emergency C-section which are done after failed induction, non-progress of labour due to repeated pelvic examinations also influenced by sterility of theatre.
- So maintaining sterility of theatre, surgical equipment, and personal hygiene can decrease neonatal infection and neonatal sepsis.

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