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Comparison of Candida Albicans Prevalence in Mouth of Newborns Delivered by Natural and Cesarean Delivery Methods

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Abstract

Oral colonization of newborns by Candida species occurs in the first few hours of life which may constitute a health risk in immunocompromised neonates. Oral candida colonization is expected to be more common in infants delivered vaginally compared with those delivered through cesarean section. The objective of this study was to assess and compare the colonization of Candida species on the vaginal mucosa of pregnant women at the time of giving birth and the oral mucosa of their newborns regarding their way of delivery. In this descriptive-analytical study, 80 pregnant women attended Shahid Sadoughi Hospital were divided randomly into two groups based on their way of delivery (natural method and cesarean section). The results were analyzed by SPSS software using non-parametric Mann-Whitney and Wilcoxon tests. Among the vaginal mothers, 15 positive cultured cultures were found to be infected with Candida albicans. In this group, the number of colonies reached to 1,000. Considering the culture media obtained from smear of oral mucosa of neonates, 15 mothers were infected with 5 infants with positive culture and growth of fungal colonies in the environment. In these five infants, the Candida fungi was transmitted and the oral mucosa was infected. In the second group (cesarean section), 12 mothers were infected with candida fungi, and no colony of fungus was observed. Candida Albicans fungi prevalence was more prevalent in newborns' oral mucosa with natural vaginal delivery. Further studies should demonstrate the relationship between maternal infection and isolating candida spices including much more patients.

Keywords: Candida Albicans, Newborns, Delivery Methods, Maternal Infection.

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Introduction

Candida constitutes a enormous family of about 200 different species, but only a few are of clinical significance, including Candida albicans, C. parapsilosis, C. krusei, C. tropicalis, C. glabrata, C. guilliermondii, C. lusitaniae, C. kefyr, C. stellatoidea, and, recently, C. dubliniensis. The most commonly isolated species from humans and the most virulent is C. albicans, which is responsible for 40% to 80% of neonatal Candida infections. (Sharp et al., 1992) Neonatal candidiasis is largely an endogenously acquired infection through prior colonization of the infant body by the fungi.(Issa et al., 2011)

Oral colonization of newborns by Candida species occurs in the first few hours of life, .(Sharp et al., 1992) and this may constitute a health risk in immunocompromised neonates. In this regard, it was estimated that 10% to 24% of children who had oral yeast infection when they were infants developed pseudomembranous candidiasis later.(Lay & Russel, 1977) Moreover, there is evidence that neonatal oral Candida colonization is a risk factor for developing Candida septicemia, especially in neonates in the intensive care unit,(Batista et al., 2014) a condition associated with high health care costs and a mortality rate exceeding 50%.(Issa et al., 2011) Later in life, the candidal oral colonization during childhood may play a key role in determining the constitution of the adult's more complex oral microbial flora.(Sampaioet al., 2014) Candida species constitute a significant part of the vaginal flora in many healthy women generally, but their prevalence and count increases during pregnancy (Sobel, 2007) Theoretically, the initial oral Candida colonization in newborns takes place via vertical route (mother to newborn) in the mother's birth canal during labor and later after birth horizontally in the hospital environment.(Bliss et al., 2008) Consequently, oral candida colonization investigated immediately after birth is expected to be more common in infants delivered vaginally compared with those delivered through cesarean section and also in infants born to mothers with vaginal colonization by Candida compared with those born to mothers without colonization.

Comparing oral candidal colonization of infants born vaginally with those delivered via cesarean section, Taheri et al. (bigom et al., 2011) reported prevalence rates of 17% versus 1.2%, and

Caramalac et al. (Caramalac et al., 2007) reported 25% versus 3.6%, respectively. However, whether maternal vaginal Candida is involved in determining the infant oral Candida colonization (Mendiratta et al., 2006; Filippidi et al., 2014) or not (Caramalac et al., 2007; Payne et al., 2016) is still being debated.

The objective of this study was to assess and compare the colonization of Candida species on the vaginal mucosa of pregnant women at the time of giving birth and on the oral mucosa of their newborns according to their delivery way (vaginal or cesarean) and to assess the relationship between vaginal Candida colonization in pregnant women and oral Candida in their newborns.

Materials and Methods:

In this descriptive-analytical study 80 pregnant weman who attended to Shahid Sadoughi Hospital included and divided randomly in to two groups of delivery by natural method and delivery by cesarean section each including 40 patients. Mothers and newborn children evaluted in each group respectively. Simple sampling method and simple random allocation used in this study.

The mothers were sampled by a sterile swab in the two groups before delivery. The smear from the vagina of pregnant women was transferred individually to Saburated-Agar candida slective culture media. The smear was cultured on a medium using parallel lines.

Neonates of each group were also sampled immediately after delivery. In this regard, the scrub method was sampled from the oral mucosa of the infants, especially in the anterior part of the mucus. Samples were cultured in an incubator for 24 hours after being transferred to a culture medium at 37 ° C and after isolating the environment from other microbes, candidiasis colony count was taken ocularly. The molds were grown in slide and stained with Methylen Blue and Gram Stain. The results were analyzed by SPSS software using non-parametric Mann-Whitney and Wilcoxon tests.

Results:

This study was performed on 80 pregnant women who were referred to the Shahid Sadoughi Hospital in Yazd for delivery. The oral mucosa of newborn babies from these mothers was also sampled immediately after birth. These 80 pregnant women consisted of a group of 40 women who were naturally given a natural treatment and prescribed a cesarean section for the 40 second group.

In the study and culture of the vaginal mothers who received the natural method, 15 positive cultured cultures were found to be infected with Candida albicans. In these groups, the number of colonies has reached 1,000 colonies. In the study of culture media obtained from smear of oral mucosa of neonates, 15 mothers were infected with 5 infants with positive culture and growth of fungal colonies in the environment. In these five infants, the Candida fungi was transmitted and the oral mucosa was infected.

In the second group (delivery by cesarean section), 12 mothers were infected with candida fungi. In the study of samples cultured from infants of these mothers infected, no colony of fungus was observed.

Comparison of colony count in samples taken from mothers and infants of these two groups was significantly different. (P-value = 0.22) (Table 1 and 2)

In the study of the statistical results obtained from the samples, there is continuity in the natural delivery group. (Table 3)

Discussion:

The 33.7% prevalence rate of asymptomatic vaginal candidal colonization in this group of healthy pregnant women, immediately before delivery, is comparable with the findings of (Babic and Hukic et al., 2010; Jombo et al., 2011; Al-Rushan et al., 2017) who reported 46.8% and 47.7% and 40% prevalence rates among healthy pregnant women, respectively, with C. albicans being the predominantly isolated species.

Although C. albicans is responsible for most of the symptomatic vaginal candidiasis cases, C. glabrata, which is largely resistant to azole antimycotic agents, has been increasingly isolated and represents a more complicated form of the disease. (Nagashima et al., 2016) This observation could be attributed to the frequent use of short courses of azole antimycotic therapies, as well as the widespread use and misuse of over-the-counter antifungal agents for treatment of vaginal candidiasis. It can be difficult to distinguish mixed Candida species growth on Sabouraud dextrose agar plates by colony morphology alone. Therefore, it is likely that some mixed Candida species growths were missed. Thus, primary culturing on CHROMagar Candida, which indicates the difference between several common species before confirming the species with the VITEK 2 identification system, might have been a better method.

During intrauterine life, the oral cavity of the infant is presumably sterile. Theoretically, when the fetus passes through the birth canal, the oral cavity may become vertically colonized by microbes that colonize the birth canal, including Candida species. In our attempt to investigate the dynamic transmission of Candida between mother and infant, mothers' vaginal Candida sampling was performed immediately before delivery, and infants' oral Candida sampling immediately after birth. Horizontal transmission of oral Candida in infants may be a prominent transmission method later in the infant's life, when yeast infection may be acquired from other sources, such as the mouths and hands of health care workers, various contaminated environmental surfaces, (Mendiratta et al., 2006) and the mother's oral flora. (Hannula et al., 1999) Relevant to this, the prevalence of oral Candida carriage in a group of neonates was shown to increase from 8.6% in the first week to 18.2% 1 month

after delivery. (Issa et al., 2011) It is also tempting to speculate that in some newborns, oral Candida may have presented immediately after birth in low counts, to the level that cannot be detected with the swab sampling technique but that can be detected few days later after establishment of microbial colonization. (Payne et al., 2016)

The overall oral Candida colonization rate in healthy full-term neonates immediately after birth in our study was 6.2%, which is in agreement with similar studies that reported 7%, (Russell & Lay, 1973) 8.4%, (Van & Leipold, 1975) and 10%. (bigom et al., 2011) However, some studies have reported much higher colonization rates of up to 18.2% (Kumar et al., 2012) and 26.7%, (bigom et al., 2011) but in low-birth-weight and premature neonates admitted to the neonatal intensive care unit. It is widely known that low-birthweight and premature neonates are more susceptible to Candida colonization and infection because of the possible involvement of intubation, intravascular catheterization, antibiotic therapy, birth defects, and immature immunity. (Lay & Russel, 1977; Batista et al., 2014) In addition, the possibility of high rates of vaginal Candida colonization among mothers of such infants may have a bearing on the oral Candida colonization of the neonates. Oral Candida colonization, of itself, may not impose a significant risk on healthy full-term infants but may constitute a significant health risk, leading to lethal disseminated candidiasis in preterm infants and those under steroid or antibiotic therapy. Preterm infants are relatively immune deficient mainly because of the decreased function of neutrophils and relative quantitative deficiency of immunoglobulin G, which is protective against Candida. (Baley, n1991) In addition, the adherence of C. albicans to the epithelial cells of premature infants is higher compared with those of full-term infants. (Cox,1986)

Currently, although prescription of antifungal therapy for asymptomatic vaginal candidiasis is not typically indicated, (Sobel, 2007) several authors have suggested screening of pregnant women for vaginal Candida and eradication of Candida to prevent subsequent infection of the neonates, especially preterms. (Mendiratta et al., 2006)

Borderon et al., (Borderon et al., 2003) in their epidemiologic study, commented on maternal Candida being a possible source for candidiasis in infants. The observation of higher prevalence of oral candida colonization in newborns of mothers with vaginal colonization by Candida has also been reported by others. (Mendiratta et al., 2006; Filippidi et al., 2014) This may be attributed to aspiration of Candida species by some newborns during passage through the birth canal. The reduced receptivity of the infantile oral epithelium to Candida at the time of birth may also explain why not all newborns born vaginally to colonized mothers harbored oral yeast. (Davidson et al., 1984)

Although the prevalence of oral Candida in the vaginally born group was higher than that in cesareanborn group, the difference was statistically. Previous studies have reported lack of any relationship between oral Candida colonization in neonates and their delivery method. (Caramalac et al., 2007; Mendiratta et al., 2006) However, when mothers harbored vaginal Candida, the prevalence of oral Candida among neonates delivered vaginally became significantly higher than that among neonates delivered by cesarean section, which indicates that the presence of vaginal Candida in mothers is an important factor for newborns acquiring oral Candida. (Bliss et al., 2008; bigom et al., 2011; Ali et al., 2012)

Several recent studies have investigated the role of maternal vaginal mucosa in transmitting Candida to neonates by using DNA molecular typing techniques and have concluded that all Candida species colonizing mothereneonate pairs were identical. (Filippidi et al., 2014; Tiraboschi et al., 2010; Hoarau et al., 2014)

Conclusion:

Candida Albicans fungi prevalence is more prevalent in newborns oral mucosa with natural vaginal delivery comparing to cesarean delivered newborns. Further studies have to demonstrate this relationship of maternal infection by isolating candida spices and also including much larger patient.

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Table 1- Mean and standard deviation of fungal colonies count in mothers

Variables	Mothers		
	Number	Mean	S.D.
Natural	40	73	191.69
Caesarian	40	51.23	164.86

Table 2- Mean and standard deviation of fungal colonies count in newborns

Variables	Mothers		
	Number	Mean	S.D.
Natural	40	1.88	6.58
Caesarian	40	0.00	0.00

Table 3-Correlation of Candida Albicans colonies in mothers and newborns in vaginal delivery method

Colonies	-			+		
-	Num.	Percent		Num.	Percent	
	25	Mother	Newborn	0	Mother	Newborn
		100	71.4		0	0
+	10	66.7	28.6	5	32	100