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Prevalence of *Streptococcus agalactiae* Infection among pregnant women in Sana'a City/Republic of Yemen and its implications for cervical cancer risk

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ABSTRACT

Infectious bacteria causing Cervical Cancer Risk are one of the major pathogens especially in developing countries. In Yemen infectious incidents are increased in recent years due to many factors as lack of regular medical check-up, carless of taking the full amount of antibiotic and malnutrition particularly among children and pregnant women. *Streptococcus agalactiae* is classified as one of the most pathogens infected pregnant women. The main aim for this study was to determining the prevalence of S. agalactiae infection among pregnant women in Sana'a City-Yemen. A cross-sectional study was carried out which include 150 pregnant women who were attending some government and private hospitals in Sana'a City for seeking health care. The period of collecting samples starting from 31 May-2021 to 12 July-2021. Results showed that, 14.2% of the examined pregnant women were infected with S. agalactiae and the infectious incidents with S. agalactiae were positively affected by some studied factors as level of education ($p<0.042$), number of abortion ($p<0.001$), previous abortions ($p<0.001$), and number of delivered ($p<0.042$). In conclusion, the obtained percentage 14% of Yemeni infected pregnant women with *S. agalactiae* could be comparable with that reported in different developing countries. Further studies with large sample size are recommended.

Keywords: prevalence, Group B Streptococsccus (GBS), *Streptococcus agalactiae*, infection, pregnant women, cervical cancer risk

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INTRODUCTION

Streptococcus agalactiae (*S. agalactiae*) is one of the most pathogenic bacteria causing Cervical Cancer Risk colonized the female reproductive and gastrointestinal tracts and their infection leads to severe incidences of inflammation in pregnant women and in their neonates [1]. About 20% to 30% of tested healthy pregnant women could be positive with group *S. agalactiae* infection, and the consequences of this infections with *S. agalactiae* range from asymptomatic colonization to septicemia that causes life-threatening newborn diseases such as pneumonia, meningitis and septic shock [2]. Worldwide a considerable variation was estimated in the existence of *S. agalactiae* in vaginal tract, when the high prevalence percent 35% was recorded in the Caribbean region and much lower existence percent's 13% and 11% were detected in Southern and Eastern Asia respectively [3]. Less variation in *S. agalactiae* prevalence was reported in some Arab countries, in Jordan Clouse *et al.* (2019) recorded 19.5% of *S. agalactiae* vaginal colonization in pregnant women, while the rates were decreased to 10.1%, 11.3% and 15.0% in United Arab Emirates, Egypt and Saudi Arabia respectively (Mohamed et al. 2020 and Amin et al. 2002). As we stated before, *S. agalactiae* infection can lead to maternal/neonatal death and stillbirth) [4]. (Besides that, some healthy problems as neurological impairment may appear after *S. agalactiae* infection among survival neonates and infants [5]. Furthermore, *S. agalactiae* is implicated in adverse pregnancy outcomes, which include preterm labour and increasing neonatal encephalopathy [6].

Yemen as developing country its population especially pregnant females are vulnerable to a wide range of infectious diseases including bacteria causing Cervical Cancer Risk (CCR) infections. Up to date, there is very few data about

the prevalence of *S. agalactiae* among pregnant Yemeni women in spite that *S. agalactiae* is an important perinatal pathogen. Therefore, this study was designed to estimate the prevalence of *S. agalactiae* among pregnant women in Sana'a City/Republic of Yemen.

MATERIAL AND METHOD

A cross-sectional study was carried out during the period from 31st May 2021 to 12th July 2021. About 150 samples were collected from pregnant women from Al-Thawra modern general hospital, Al-Sabain hospital, Palestine maternity, childhood Hospital, Typical Azal medical central, Maha Albaidani Hospital and Dr. Belqis Alansi medical central in Sana'a City. Inclusion criteria was pregnant women in Sana'a City/Republic of Yemen and exclusion criteria were abortion women and women after delivered [7].

Data collection

The history of infection was taking from each mother included in the present study, a standard questionnaire was used which consist of the following information: Name, ID number, age, address, Education level, number of deliveries, number of abortions, antibiotic used.

Samples collection

After Hospitals and participant consent, samples were collected. Vaginal sampling was obtained from the vaginal introits wall by using a sterile vaginal swab that was implemented by a trained nurse. The obtained samples were then, labeled and transferred immediately to the Lab; for microbiological procedures.

Microbiological procedures followed the method described [8]. Briefly, the collected samples (vaginal swab) were seeded in Todd-Hewitt broth 1-2 mL+colistin 10 μg mL^{-1}+nalidixic acid 15 μgmL^{-1}. The sown stock was then incubated at 35°C for 18 hours-24 hours and after that transferred to plate containing 5% sheep blood agar and incubate for 24 h with seeding technique for isolation. Suspicious β or γ hemolytic colonies were taken from the plates. The bacteria causing Cervical Cancer Risk (CCR) identification was performed by colonial morphology tests.

Statistical analysis

SPSS version 19 was employed to analyses all data. The chi-square test was used to examine association between prevalence of *S. agalactiae* and many studied factors.

RESULTS

The basic characters of studied yemeni pregnant women

The basic characters of patients (150 pregnant women in Sana'a city) included in the current study are summarized in the Table 1 which show the ages of the patients classified into three groups 64 (42.7%) were less than 25 years, 58 (38.7%) were between 25 years-30 years old and 28 (18.7%) were more than 30 years old. The majority of the pregnant women 137 (91.3%) were urban and 13 (8.7%) were rural (come to Sana'a for healthcare). Regarding to the education level, five educations levels were observed, with the high number of pregnant women 55 (36.7%) were in high school education level. Most pregnant women 112 (74.7%) enrolled in this study were diagnosed with urinary tract infections, 63 (42%) were with history of past abortion whereas 87 (58%) were without history of previous abortion. Furthermore, 11 (74%) didn't use antibiotics and 39 (26%) used antibiotics.

Tab. 1. Basic characters of studied Yemeni pregnant women

Variable		Frequency	Percent (%)
Age groups	25 ≥	64	42.7
(Years)	25-30	58	38.7
	30 ≥	28	18.7
	Total	150	100
Residency	Urban	137	91.3
	Rural	13	8.7
	Total	150	100
Education levels	Illiterate	23	15.3
	Primary	18	12
	Middle school	20	13.3
	High school	55	36.7
	University	34	22.7

	Total	150	100
Presence with urinary	Yes	112	74.7
tract infections	No	38	25.3
	Total	150	100
Presence with past	Yes	63	42
Abortion	No	87	58
	Total	150	100
Number of abortions	No	84	56
	One	39	26
	Two	18	12
	More than3	9	6
	Total	150	100
Number of births	One	35	23.3
	Two	28	18.7

Prevalence of *Streptococcus agalactiae* among studied Yemeni pregnant women

Figure 1 show that, the prevalence of *S. agalactiae* among pregnant women in Sana'a city was 14.2% (21) out of 147. This prevalence was influenced by many studied factors as age when the high rate 17.2% was estimated in pregnant women who their ages were between 25 years-30 years [9].

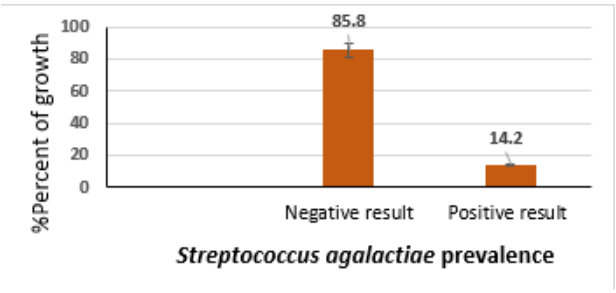

Fig. 1. The prevalence of Streptococcus agalactiae among studied Yemeni pregnant women

Varied education levels was associated with significant variation ($p<0.05$) in percent of infection with *S. agalactiae* among Yemeni pregnant women when the high rate 34.7% of infection was determined in Illiterate pregnant women compared to other educated levels Table 2.

Tab. 2. Effect of residence and education level on the prevalence of infection of *Streptococcus agalactiae* among studied Yemeni pregnant women

Variables		*Streptococcus agalactiae*		Percent of positive cases	p-value
		Growth	No growth		
Residency	Urban	11	118	8.5	0.88
	Rural	2	19	9.5	
Education level	Illiterate	8	15	34.7	0.042
	Primary	2	16	11	
	Middle school	2	18	10	
	High school	5	50	8.4	
	University	4	30	9.5	
	Total	21	129	73.6	

Data represented by Chi square, $p<0.05$

Other studied factors as presence with past abortion, number of abortion and number of birth were significantly influenced on the infection of *S. agalactiae* among studied Yemeni pregnant women Table 3.

Tab. 3. Effect of the presence of past abortion, number of abortion and number of birth on the prevalence of infection of Streptococcus agalactiae among studied Yemeni pregnant women

Variables		*Streptococcus agalactiae*		Percent of positive cases	p-value
		Growth	No growth		
Presence with past abortion	Yes	18	45	28.5	<0.001
	No	3	84	3.4	
Number of Abortion	No	2	82	2.3	<0.001
	One	5	34	12.8	
	Two	10	8	55.5	
	3 ≤	4	5	44.4	
Number of Birth	No	4	41	8.8	0.005
	One	5	30	14.2	
	Two	0	28	0	
	3 ≤	12	30	28.5	

Data represented by Chi square, p<0.05

The results in Table 4. showed that the prevalence of *S. agalactiae* in pregnant women who use the antibiotics was significantly higher (p<0.05) than pregnant women who do not use antibiotics [10-12].

Tab. 4. Effect of antibiotic on the prevalence of infection of *Streptococcus agalactiae* among studied Yemeni pregnant women)

Variables		*Streptococcus agalactiae*		p-value
		Growth	No growth	
Antibiotics using	Yes	1	38	0.017
	No	20	91	
	Total	21	129	

Data represented by Chi square test p<0.05.

DISCUSSION

The Group B *Streptococci* (GBS) which include *S. agalactiae* are accused of spreading a wide variety of chronic infections particularly in the pregnant period [13, 14].

According to the Center For Disease Control (CDC), cultures are the gold standard method for S. agalactiae screening in pregnant women at 35 weeks–37 weeks of gestational age [15, 16]. Pregnancy has been associated with high incidence of invasive S. agalactiae disease. In Āmulti-state evaluation from 2007–2009, the incidence of invasive disease due to S. agalactiae was twice in pregnant women compared to non-pregnant women [17-19] The present study was reported the prevalence of S.agalactiae in Yemeni pregnant women in Sana'a city was 14.2% out of 147 [20, 21]. Similar results were reported in their study which was carried out in Cameroon with prevalence rate of S. agalactia 14% among pregnant women. Also, higher results were reported by with prevalence percent of *S. agalactiae* 25% in Italian pregnant ..... and 20.5% in Ethiopia Recent study in Yemen recorded lower prevalence rate of S. agalactiae 10.95% among pregnant women than the current study. his variation in the results of prevalence of *S. agalactiae* among pregnant women could be attributed to the variation of food habits, climate, maternal and hygiene culture methods; including the number and type of sites cultured and type of medium used he prevalence of *S. agalactiae* was varied according to the age of pregnant women; pregnant women in age group 25 years-30 years old had higher prevalence of *S. agalactiae* (17.2%) than other age groups. hese results are in agreement with that recorded study who reported the infection of *S. agalactiae* was higher in age group 26-35 with the infection percentage13% compared to other age groups (p>0.05). In contrast, different results were displayed with high infection with *S. agalactiae* was detected in the age less than 20 years in Iranian pregnant women (p>0.05). In addition, the

infection in respect to education level was studied, these results found that 15 (34.7%) of illiterate pregnant women were positive for *S. agalactiae* infection that was significantly higher than other education levels. These results are in disagreement with that reported who reported there was no significant difference in infection of *S. agalactiae* based on education level [22]. The infection of *S. agalactiae* in pregnant women with history of previous abortion was 18 (28.5%) compare to less infection 3 (3.4%) in pregnant women without previous abortion. These findings were in disagreement with those obtained by Dashtizade and Zolfaghari, (2020) who reported that there was no statistical significant difference in *S. agalactiae* in respect to history of abortion p>0.05. Also the present study found that the prevalence of *S. agalactiae* was significantly influenced by the number of abortions among pregnant women reported non-significant difference between infection of *S. agalactiae* based on the history of pregnancy with p-value >0.05 [23, 24].

CONCLUSION

Based on the results obtained of the present work, we can conclude that; the rate of prevalence of *S. agalactiae* among Yemeni pregnant women in Sana'a city was 14.2% which could be put in the range estimated in many developing countries. Th e infectious incidents with *S. agalactiae* were significantly affected by the level of education, number of abortion, previous abortions, and number of delivered among studied pregnant women. On the other hand, no significant association was found between the infection with *S. agalactiae* and age, residence and urinary tract infection among examined Yemeni pregnant women. Further studies with large sample size are recommended.

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