

Are Mikvehs Responsible for GBS Carriers among Orthodox Jewish Women?—A Prospective Observational Study

Jacky Herzlich^{1,2,3}, Daniel Lubin^{1,3}, Yehudit Schindler^{1,4}, Osnat Wittmann^{2,3}, Ronella Marom^{2,3*}

¹Departments of Neonatology, Mahayanei Hayeshua Center, Bney Brak, Israel

²Departments of Neonatology, Lis Maternity Hospital, Tel Aviv Sourasky Medical Center, Tel Aviv, Israel

³Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

⁴Departments of Microbiology, Mahayanei Hayeshua Center, Bney Brak, Israel

Email: *marom.ronella@gmail.com

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Abstract

Background: Maternal colonization with group B streptococcus (GBS) is an important risk factor for neonatal sepsis. A “mikveh” is a pool of water for ritual immersion by Jewish women. It had been reported to be a risk factor for GBS colonization. **Objective:** To determine whether there is an association between ritual immersion in the mikveh pools and GBS carriership. **Methods:** Water samples and bacterial swabs were taken from eight mikveh pools centers at two separate occasions and tested for GBS growth. For determination of the total number of live, aerobic bacteria, each sample was grown on strep selective agar for 48 hours at 37°C and CO₂ 5%. **Results:** All the samples were tested. No trace of GBS was found in any of the samples. **Conclusions:** The findings of this study refute earlier findings and suggest that there is no association between ritual immersion in mikvehs and GBS carriership.

Keywords

Group B Streptococcus Carrier, Mikveh, Colonization, Religiosity, Early on Set Sepsis

1. Introduction

Invasive group B streptococcal (GBS) disease plays an important role in infectious illness and death during the first week of life. Clinical trials in the 1980s showed that early-onset GBS infection and disease were significantly decreased

by administering prophylactic antibiotics intrapartum to women who were colonized with GBS [1] [2] [3] [4]. Women who are identified as being GBS-colonized through culture-based screening are 25 times more likely to deliver an infant with early-onset infection than women with negative prenatal cultures [5]. Identification of maternal colonization through universal, culture-based screening with the recommendation of providing intrapartum antibiotic prophylaxis (IAP) for women with positive screening results has been recommended since 2002 [6]. This strategy is endorsed by the American Academy of Pediatrics, and it has been widely adopted in the United States, resulting in an estimated 80% decrease in early-onset GBS infection [7].

In Israel, the official policy of the Ministry of Health since 2005 has been to avoid general screening in pregnant women for GBS colonization between gestation weeks 35 - 37 because of the low incidence of early-onset sepsis (EOS) due to GBS in neonates [8]. There has, however, been a gradual increase in the incidence of GBS carriage in Israel during the past few years [9] leading to a search for its source.

A mikveh is a pool of water used by both men and women for the purpose of ritual immersion for purification after a thorough cleansing of the entire body. Non-pregnant orthodox Jewish women attend a mikveh each month approximately for 14 days since the onset of menses. In 2015, Drai-Hasid *et al.* reported that immersion in a mikveh pool is a risk factor for GBS colonization [10]. We questioned the validity of that claim since the chlorine used to sanitize the water in mikveh pools is the same as that used in swimming pools. This study was designed to determine whether there is any association between immersion in the water of mikveh pools and GBS carriage.

2. Materials and Methods

A total of sixteen water samples were collected manually straight from the pool in sterile well-labeled 100 ml bottles and a total of sixteen surface swabs were collected by friction and scratching the pool's walls surface manually. The samples were purposively collected twice on different Sundays from eight different mikveh pools located in one city in the center of Israel that has a large population of ultra-Orthodox Jews. The pools were filled with fresh water on Thursdays and it was not replaced until Sunday. An average of 100 women attend each evening, which means that around 300 women had used the mikveh by the Sunday morning we examined the water. The water samples were collected in morning before a pool routine cleaning according to standard methods for the examination of water and wastewater [11], transported at 4°C within 1 hour from the collection time, using appropriately insulated coolers, to the outsourcing microbiology laboratory accredited for performing a water testing.

The surface swabs were collected from the pools walls by sterile transport swabs (Transwab® Amies, Copan) and were transferred to Mahayanei Hayeshua microbiology laboratory for further investigation.

3. Laboratory Analysis

Total Aerobic Plate Count

Membrane filtration technique was employed to determine a Total count of viable GBS in accordance with Israeli Ministry of Health guidelines, State of Israel American Public Health Association (APHA), 9222D and 9260F.

For each test the 100 ml of the pool water sample was aseptically filtrated. The filters were placed on plate count agar (PCA) and grown for 3 days at 37°C to determine the total number of live, aerobic bacteria. The number of bacteria is expressed as colony-forming units per ml (CFU/ml).

Isolation of GBS

For GBS detection the filters and the surface swabs were cultured on selective media (Strep selective agar; Hy-labs) and incubated for 48 hours at 37°C with 5% CO₂. From each Strep selective agar plate a suspected colonies were isolated, Gram stained using AerosprayWescor, Slide stainer Cyto centrifuge and observed with a light microscope (Olympus BX43, USA). Identification of GBS was performed by classical/biochemical methods according to the literature [12] [13] and using the VITEK® MS (bioMerieux, France) system. The study protocol was approved by the Mahayanei Hayeshua Medical Organization Institutional Review Board.

4. Results

Eight different mikveh pools in two different time points in a lag of a week were sampled. All samples were taken manually by the same person; the principle investigator (JH). Sixteen containers with 100 ml of water in each were prospectively taken from the pool, total of 1600 ml of pool water for laboratory testing. Also sixteen bacterial swabs were taken and scratched from the pools walls and were cultured for growth of GBS. In none of the water samples nor the pools wall bacterial swabs GBS was detected or isolated, and all cultures were determined as being negative for GBS.

5. Discussion

To the best of our knowledge, this is the first prospective study that evaluated the incidence of GBS in water samples and from swabs from Mikvehs' walls. There has been a constant increase in the prevalence of group B streptococcus carrier status in Israel, from around 3% in the 1980s reaching up to 17% in 2010 [8], and continuing to rise to 22% from 2010 to 2016 [7]. In contrast to the large increase in the prevalence of GBS carriers, the prevalence of early-onset sepsis (EOS) due to GBS among the babies born to mothers with a risk factors for EOS decreased from 0.71/1000 births to 0.52/1000 births, and from 0.33/1000 births to 0.18/1000 births in 2016 among the babies without a maternal risk factor for EOS [7]. Concerns about a correlation between the increase in GBS carriers and maternal ritual bathing in mikveh have risen since Draï-Hasid *et al.*'s publication [10]. In contrast to the former study by Draï-Hasid *et al.*, who suggested an

association between ritual immersion in Mikvehs and GBS carriership according to a cross-sectional survey from 436 parturient Jewish women from Jerusalem, we in a prospective manner, tested cultures for GBS in the Mikvehs and not the GBS status of the mothers. Our systematic search of the published literature in PUBMED failed to yield any other report on this issue. Although the numbers of sampling were small (the Religiousness and holiness of the places prevented us from taking more samples in different time points) the strength of the study was the prospective methods which the data were collected.

6. Conclusion

The results of our current investigation raise the possibility that there is no association between ritual immersions in mikvehs to GBS carriers among the women who attended them. The routine use of a chloride substance for sanitizing the mikveh pools is probably responsible for the eradication of GBS.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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