International Journal of Advanced Community Medicine

E-ISSN: 2616-3594
P-ISSN: 2616-3586
IJACM 2019; 2(1): 23-29
Received: 01-01-2019
Accepted: 10-02-2019

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# Awareness of Primary Care Physicians about Pregnancy Screening of Group B Streptococcus Infection at Prince Sultan Military Medical City, Riyadh, Saudi Arabia

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**DOI:** https://doi.org/10.33545/comed.2019.v2.i1a.06

**Abstract**
**Background:** Group B streptococcus is a leading infectious cause of morbidity in newborns and causes substantial disease in elderly individuals. Guidelines recommended antenatal culture-based screening as the optimal method for identifying chemoprophylaxis candidates.
**Objectives:** To assess the primary care physicians' knowledge about group B streptococcus screening in pregnant women and to identify the barriers that prevent primary care physicians from screening as recommended.
**Methods:** A cross-sectional study conducted at the Al-Wazarat healthcare center, Prince Sultan Military Medical City, Riyadh, Saudi Arabia. A self-administrated questionnaire was distributed to 89 physicians asking about their knowledge and barriers regarding group B streptococcal infection High Vaginal Swab (HVS) screening.
**Results:** The GBS screening average knowledge is 74.0% distributed on 11.2% scored poor, 31.5% good, and 57.3% excellent level of knowledge. Eight physicians' attitude was positively agreeing with GBS screening statement with lowest agreement was in performing screening with primary care setting (76.4%). The barriers for GBS screening are system and protocol (52.8%), lack of training (46.1%), lack of tools (24.7%), fear of consequences (14.6%), and other barriers (16.9%). Regression analysis showed that in comparison to physicians younger than 30 years, physicians aged 30 – 39 years has higher average by 9.4% (p-value = 0.039), 40 – 49 years have higher knowledge with average 10.3% (p-value = 0.036), 50 years or older have higher knowledge on average 8.9% (p-value = 0.040)
**Conclusion:** Education programs regarding GBS screening in pregnancy are needed to improve the primary care physicians' knowledge in order to prevent inevitable complications of GBS infection in pregnancy.

**Keywords:** Group B Streptococcal, Pregnancy Screening, Infection

## 1. Introduction
Group B streptococcus infection is one of the most common life-threatening bacterial infection in human newborns [1]. These bacteria are normal resident of the vaginal flora in 25% of healthy women [3]. Infections in newborns occurring within the first week of life are categorized as early-onset disease (EOD). Late-onset infections (LOD) occur in infants aged >1 week, with most infections evident during the first three months of life.
Because of the burden of the disease among infants and the availability of effective interventions to prevent early-onset GBS disease, the guidelines concern only EOD. The measures used to prevent early-onset GBS disease also might prevent some perinatal maternal infections; however, they do not prevent late-onset infant disease [4, 5].
The risk of GBS is still one of the most prominent threats despite the efforts to reduce it in the last 30 years [9]. Knowledge of causes of neonatal infection is essential to develop effective strategies to prevent and treat serious neonatal infections and support progress toward reducing mortality in children aged less than five years [5].
Few studies were found with the literature review related to this research topic and objectives. No similar studies locally or globally that tried to assess the primary care health physicians' knowledge about GBS screening in pregnant women were found. However, there are plenty of literature studies and reviews that discuss the importance of screening for GBS infection in pregnancy and its effect on minimizing neonatal outcome complications of this

infection. A study reported that in the US between 1998 and 2004 the screening increased from 48.1% to 85.0% [10]. Such increment reduced the amount of missed cases and increased the number of mothers who are treated with antibiotics [10]. The effect of universal screening program was also reported positively in other countries [11, 12].

Although GBS infection can be not common in pregnancy, the consequence of it on the newborn can be critical [13]. Signs and symptoms occurring within hours after delivery sepsis, pneumonia, and meningitis, are the most common complications of newborns. Also, Breathing problems, heart and blood pressure instability, gastrointestinal and kidney problems [14]. Therefore, many organizations In 2010, the Control Disease Center (CDC) published a guidelines prevention of perinatal group B streptococcal disease. The CDC recommended universal screening at 35- 37 weeks of gestation. In addition, they recommended the use of intrapartum antibiotics prophylaxis for maternal group b streptococcus colonization. They reported a substantial reduction in the burden of early-onset group B streptococcus disease among newborns. Although the CDC reported a decline in group b streptococcus among newborns, the incidence rate among mothers remained unchanged [15].

Because of prevention efforts, the incidence of group B streptococcus declined over past 15 years from 1.7 cases per 1000 live births in early 1990 to 0.54 – 0.37 cases per 1000 live births in recent years in United States The literature shows that there are high prevalence and high risk of GBS carrier stat during pregnancy. A cross-country study in Europe of 24,093 women from 13 countries reported that GBS colonies in the vagina rates ranged from 6.5 to 36%. One-third of studies reporting rates of 20% or greater [14]. In the United States, a retrospective study of 14,573 reported stable incidence over six years period of 12 cases per 1000 among pregnant women [2]. Additionally, the prevalence was reported in several studies. In Italy, the prevalence was found to be 17.9% among 5020 pregnant women tested between week 35 and 37 of gestation [16] In the United States, a retrospective study of 14,573 reported stable incidence over six years period of 12 cases per 1000 among pregnant women [17]. In Saudi Arabia, the prevalence of GBS among pregnant women was reported to be around 10.8% in a sample of 9,698 pregnant women in Jeddah [18]. and 31.6% in a sample of 326 pregnant women attending a teaching hospital in Riyadh [19].

Not every newborn who is born to a GBS carrier mother will be affected by the infection. Only a very small percentage of babies born from a carrier mother who is not treated with antibiotics can develop signs and symptoms of GBS, especially, if the mother considered having the higher risk of delivering a newborn with GBS. For example, with premature labor, a urinary tract infection because of GBS during your pregnancy or with a history of delivering a previous baby with GBS. Many studies assessed the physicians' adherence to GPS screening guidelines. In 2013, a clinical audit of 877 live births in 11 counties at Tennessee State reported that 84.7% of the women were screened for GBS [20]. However, just 26.3% of prenatal tests with documented test dates were before 35 weeks of gestation [20]. The compliance rate was similar in a study conducted among 31 women who undergone unscheduled Caesareans [21]. In this study, the compliance with guidelines was found in 26/31 (83.9%) of the cases. A similar study conducted on 115 women underwent unscheduled Caesareans in the US [22]. The compliance to GBS Testing was in 80 cases (69.6%). The overall adherence was found to be high in developed countries. However, there are no studies investigate the physicians' knowledge or adherence to guidelines in Saudi Arabia as far as our search is concerned. This is where this study can contribute to a critical issue. The knowledge, awareness, and practices of physicians are corner stones in combating the disease and its consequences locally and regionally.

This study tackles a neglected area in the literature. The knowledge of GBS screening among health care providers, especially primary care physicians are rarely assessed. The scarcity of studies in a subject that still affects a large number of newborns need to be addressed. Therefore, this study about primary care physician awareness tries to bridge the gap in the knowledge about GBS screening.

## Subjects and Methods

This work aimed to improve the primary care physician knowledge about the importance of screening in antenatal for group B streptococcus. The objective of this study was to assess the primary care knowledge about group B streptococcus screening in pregnant women; and to identify the barriers that prevent primary care physicians from screening as recommended. The study was conducted at the Al-Wazarat Health Centre (WHC). The Centre is one of 18 primary healthcare centers operated by PSMMC in the Saudi capital city of Riyadh. The center is the largest primary care center operated by PSMMC. 124 primary care family medicine physicians are registered at the center's Rota.

### Inclusion Criteria

- Primary care family medicine physicians
- Working currently at the Al-Wazarat healthcare center
- Availability for answering the questionnaire

### Study Design

The study design is cross-sectional.

### Sampling Method

The sample size was estimated based on estimating the prevalence of knowledge among the physicians using the following procedure:

Population: Total number of available family medicine physicians 124.

$\delta$ = 5% the error tolerance around the expected prevalence of knowledge level

p: expected level of prevalence = 0.5 (this is the default assumption when there is no available source from pervious study or reliable pilot study. This assumption maximizes the sample size estimated)

The sample size was calculated at 95% confidence level. The sample size was calculated using the following formula:

$$Sample\ Size\ (SS) = \frac{Z^2 * (P) * (1-P)}{\delta^2} = \frac{(1.96)^2 * (0.5) * (0.5)}{(0.05)^2} = 377$$

However, since we are assuming that we have a finite target population (124 the whole population), then the Sample size (SS) from the equation above can be adjusted as follows:

$$New\ SS = \frac{SS}{1 + \frac{SS - 1}{Population}} = \frac{377}{1 + \frac{376}{124}} = \frac{377}{4.03} \approx 94$$

From the equations above the sample size needed = 94 physicians. The questionnaire was conveniently distributed to 97 available physicians. The convenient sampling of the available physicians yielded 89 completed questionnaires. The incomplete questionnaires are 8 resulting in a response rate of 91.7%

We used a self-administrated questionnaire filled by the participated physician. The questionnaire face validation commenced after the initial design. Through the feedback from 2 consultants of family medicine and a statistician, the face validity of the questionnaire was established. The second part used consisted of validating the questionnaire temporal validity and inner stability using test-re-test method. A pilot study of 15 physicians were used for the test-re-test phase. The principle investigator distributed the questionnaire among the participated physicians who were used using convenient sampling. After filling the questionnaire, the participants were asked if they could be contacted to fill the questionnaire again. After two-weeks the questionnaire was distributed again.

The questionnaire consists of 5 sections. The first section concerns the sociodemographic and diabetes history data. The second section asked the questions about their knowledge of GBS and GBS screening. The third section asked the participants about their attitude towards the GBS screening. The fourth part quizzed the participants about the practices of GBS screening. Finally, the fifth section concerned with the barriers to GBS screening from the physicians' point of view.

**Reliability**

The reliability of the questionnaire (inner consistency) was analyzed without using the sociodemographic and knowledge questions. The sample size used for the test-re-test questionnaire is 15 participants. The knowledge part was not included due to the potential bias in these types of questions in the re-test phase. Knowledge of the participants may change after the exposure to questions about their knowledge. Participants may seek to check their answers after the questionnaire. Additionally, the reliability also cannot be conducted in knowledge nature questions, as the inner consistency does not hold. Knowledge levels may differ dramatically between individuals and therefore the principle of inner consistency cannot be applied. Cronbach's Alpha (CA) was used to test the reliability (inner consistency) of the practice part. The Cronbach's Alpha for the tool equals = 0.86. The common practice is to accept 0.7 as the minimum reliability level. Some sources accept 0.65 for exploratory researches. Other sources indicated that for practicality the minimum accepted level is 0.80. [23] We achieved a minimum reliability level that is acceptable regardless of the cut-off point used.

**Validity Analysis**

The validity Analysis was conducted using measures of agreement between the questions. The measures of agreement used is Intra Class Correlation (ICC). The attitude, practice, and barriers parts contained 16 questions. The minimum accepted ICC level is 75% for the question to be considered in the questionnaire [24].

No questions produced lower than 75% ICC and hence no questions were dropped. The results indicate high agreement between the test-re-test questionnaires and therefore we consider our questions valid.

The results obtained from the tool validation process indicate that our tool is reliable and valid. Therefore, the tool was considered without changes for distribution.

**Scoring Method**

We applied the following method for scoring for the knowledge section:

1. The numbers of questions are 9 for knowledge section.
2. Each question will have two possible outcomes (correct, incorrect).
3. Each correct answer takes a value of 1 while the incorrect answer 0.
4. The maximum score will be 10 in the knowledge.
5. A score out of 100 will be calculated by dividing the actual score over the maximum score.
6. We will use the quality control criteria of 70% as our benchmark of deciding the 'good' knowledge or good from 'excellent' knowledge [25].
7. The benchmark 50% will be considered as the poor knowledge mark.
8. The categorizing of the score for knowledge:

- Score < 50% = poor
- 50% - < 70% = good
- > = 70% = excellent.

**Data Management**

The data collection phase started 01/12/2016 and finished by 28/02/2017. The author distributed the questionnaire to 97 patients until the sought sample size achieved. This accounts for approximately 91.7% response rate. The data were coded and entered into MS-Excel 2016. We used a macro to define certain values into Excel, so the data will be restrained to only the values defined by the coding system to avoid typos and mesenteries. The data then transferred to an SPSS version 22 template for statistical analysis.

The statistical analysis in this study consisted of two parts. The first part is the non-theoretical descriptive statistics and. Graphical representation of the knowledge classification also is presented using pie chart. The second part consists of hypothesis testing. The hypothesis testing based on the assumption that scores for knowledge and practice are continuous normally distributed variables. Each of the scores will be considered as dependent variable and will be regressed using ordinary least squares (OLS) regression against strings of independent variables. The 'best-fitting' model then will be selected using information criterion (IC). There are two information criterions widely used for model selection. The first is Akieke's Information Criterion (AIC) and Bayesian Information Criterion (BIC). The idea of IC is choosing the model that gives best explanation (R2) with least complexity. Introducing variables to the regression model always improves the explanation of the model but it is also increases the complexity of the model with the new added variables. AIC and BIC try to keep a trade-off between the amount of improvement and complexity added by the new variables. The 'best' model is the model that minimizes the IC. We will use AIC for our analysis as it is more theoretically established [26]. The sample size calculation and statistical analysis was conducted by the

Biostatistician at PSMCC (O.A.)

**Ethical Considerations**

The ethical committee at Prince Sultan Military Medical City (PSMMC) approved the study. Permission was taken from the family and community medicine department before the pilot study. The research did not include any interventional therapies or any form of medical testing. A participants' information sheet was handed to the participants before filling the pilot study questionnaire. The questionnaire was anonymous, and all the data collected were used for research purposes only. Informed consent was distributed along with the questionnaire during collecting the data. The participants were informed that their participation is voluntary and they are free to refuse the participation in the study or withdraw at any stage without being asked about the reasons or being persuaded. The participants were informed their refusal or withdrawal from the study participation has no consequences and their information will be confidential. The final questionnaire was distributed after taking permission from the in-charge doctor of WHC.

**Results**

The analysis of the data obtained from the physicians are provided in this section. The physicians' characteristics are presented in Table2. The participated physicians mostly are less than 40 years old (697%). Females formed 50.6% of the sample. Saudis physicians were slightly higher than non-Saudi (57.3%). In terms of their experience, physicians that have less than 5 years of experience formed 40.4%, 5 – 9 years 27.0%, 10 – 15 years 11.2%, and over 15 years of experience 21.3%. Most of them are educated regionally 61.8%. The professional title of these physicians are residents (37.1%), registrar/senior registrar (30.3%), and consultants (21.3%).

The knowledge of physicians' about GBS screening was assessed using 9 statements in the questionnaire. In Table 3 we present the statements and percentage of correct answers received for each statement. Using the scoring system described in the methodology the average score was 74.0%. Figure 1 shows the classification of the participants in terms of their score using the 3-categories scoring classification. The level of knowledge was generally excellent among the physicians. Only 11.2% scored poor level of knowledge, 31.5% good, and 57.3% excellent. In Table 3, the statements that showed the least correct answers (below the 70% mark) 26 are asymptomatic pregnant woman does need to be screened (41.6%), Does GBS carrier status is prevalent among pregnant women. (59.6%), and Patient with previous past history of infection only should be screened (66.3%).

The attitude of physicians towards GBS testing was investigated through 5 statements in the questionnaire. The results of the questionnaire are presented in Table 4. All the answers showed high agreement with the statements.

The GBS screening practice was assessed using 6 statements in the questionnaire. The training for GBS screening was low (30.3%) among the physicians. Most of the physicians reported the need for training in GBS screening (73.0%). Only 21.3% reported performing GBS screening in their clinics. Almost half of the physicians (57.3%) expressed they have no fear from GBS screening complications. Physicians who train junior staff formed only 16.8% of the sampled physicians. Approximately half of the physicians reported giving antibiotics to GBS infection during pregnancy.

Finally, the physicians were asked about the barriers for performing GBS screening. The barrier reported most was the system and protocol (52.8%), lack of training (46.1%), and lack of tools (24.7%). 27 The knowledge determinants are investigated using OLS regression. All sociodemographic variables are included in the full model. The best model is selected using AIC as indicated previously in the methodology section. Table 7 shows the results of the regression analysis. The R2 = 16.8%. This means the best model explained 16.8% of the variability between the participants in the level of knowledge. In comparison with the physicians under 30 years old, the other age groups show significantly higher average score. Age group 30 – 39 on average has higher knowledge score by 9.4 points, 40 – 49 has higher knowledge by average 10.3, and finally, physicians over or equal 50 years have higher average knowledge by 8.9 points.

**Discussion**

GBS infection in the neonates is one of the serious life-threatening disease. In 2011, an estimated 7.2 million deaths in children less than five years occurred, 40% of these within the first month of life [6]. Severe infection contributes to approximately one-third of neonatal deaths in developing countries, which is where neonatal mortality is concentrated. [5-7] In 2012, a study conducted on 200 women carriers of GBS found that 80% of newborns were colonized [8].

Unfortunately, the risk of GBS is still one of the most prominent threats despite the efforts to reduce it in the last 30 years [9] Knowledge of causes of neonatal infection is essential to develop effective strategies to prevent and treat serious neonatal infections and support progress toward reducing mortality in children aged less than five years [5]. This study was aimed to determine the awareness of the primary care physicians about antenatal screening regarding GBS infection.

Sadly, many international studies show paucity in the physicians and mothers knowledge regarding the screening despite the international recommendations. In a qualitative study done in UK to assess the effect of having a baby infected with GBS infection on the mother's perception the 37 study found that None of the mothers had prior knowledge of GBS before their baby was affected and There was a lack of knowledge about GBS infection and screening among some GPs which supposed to be the main resources of information regarding this disease for those mothers. Another study done in Canada found only 66% of the GPs practice the guideline regarding screening of GBS in pregnant women [28]. However, Comparing the awareness of GBS antenatal screening reported in currant study with previous studies are considerably difficult due to the paucity of similar studies done in the same field.

This cross-sectional study among 89 family medicine physicians at the Al-Wazarat Healthcare Centre reports good knowledge of GBS screening among the physicians. The analysis of the results showed that the mean score of knowledge about GBS screening was 57.30%. This is not acceptable regardless of the scarcity of similar previous studies in Saudi Arabia with the same objectives to compare. The results may be rationalized by the unavailability sittings in primary care clinics to screen for GBS and lack of knowledge in system and protocols or lack

of training. 38 The age of the physician seems to influence the knowledge positively when compared to physicians at the beginning of their career. No other factors seem to play a role in the level of knowledge.

The knowledge about GBS among the physicians in our investigation was good but still substandard. Only 11.2% of the physicians scored poor level of knowledge. The poor level of knowledge was mostly noted with young physicians (younger than 30 years) which can reflect their lack of experience. However, these levels of knowledge can be improved with further educational programs or by more effort to improve the awareness among young physicians.

Many studies conducted among pregnant women to prevent group B streptococcus disease. But very minimal studies done to evaluate the awareness of family physicians about screening of GBS in pregnancy. By comparing the result in current study of family physicians regarding GBS antenatal screening, 21.3% doing the screening and 66.3% are not doing it which is less than in Canada whereas adherence to the guidelines is 66%, which could be explained by the same reasons and obstacles which our primary care physicians face it here in Saudi Arabia [28] 39 The study results additionally indicate that the physicians' attitude towards GBS screening is positive with slight concern about performing such test in primary care setting. Most of the physicians in the current study agree with the importance and benefits the screening. However, their practice was unsatisfactory. Furthermore, the prevalence of screening (21.3%) is significantly smaller than the prevalence rates recorded in similar settings. [10, 27] This is also noted for the levels of administrating intrapartum antibiotics (50.6%) that is lower than the levels in other studies in the US [10] and other developed countries. [9] This could be due to the lack of training among the physicians (66.3%) and the need for more training (70.0%) which was very notable in the results. These reported barriers can be tackled with internal guidelines and universal testing policy that can be applied in the primary care setting. [10, 20] The time of screening should be catch up from 35-37 week which usually missed by the patient in the specialty clinics. Therefore, the responsibility on the primary care physician is high. Therefore, the recommendations for introducing more programs for training physicians were established by several studies [5, 9, 10, 27]. 40 Finally, the level of knowledge was regressed against several variables as predictors for the score. The only statistically significant factor was the older age of the physicians predicts higher level of knowledge. The more senior physicians showed better levels statistically in comparison with their juniors' counterparts. This can be due to the higher exposure and experience among these physicians when compared to the physicians who are newly practicing.

**Conclusion and recommendation**

The levels of knowledge and attitude about GBS screening are very encouraging. However, more training and internal policies are needed to develop better practice. The physicians training and policies development should be with cooperation with the practitioners that improve the health service and establish universal guidelines that will limit missed screening cases.

1. More GBS screening training for physicians to increases their knowledge, and practice.
2. Further consideration in the system and protocols to make the screening less problematic to perform.
3. Further studies investigating the adherence to guidelines among primary care physicians regarding GBS screening.
4. A small leaflet will be distributed to all Wazarat health centre physicians to improve their knowledge regarding GBS screening guideline Adopted from AAFP (Jul 1, 2012 Issue) [29] (appendix 6).

**Table 1:** Sociodemographic characteristics of the participants (n=89)

| Characteristic | Frequency | Percentage |
|---|---|---|
| Age (years) | | |
| ≤ 30 | 33 | 37.1 |
| 31 – 39 | 29 | 32.6 |
| 40 – 49 | 15 | 16.9 |
| ≥ 50 | 12 | 13.5 |
| Total | 89 | 100.0 |
| Gender | | |
| Male | 44 | 49.4 |
| Female | 45 | 50.6 |
| Total | 89 | 100.0 |
| Nationality | | |
| Saudi | 51 | 57.3 |
| Non-Saudi | 38 | 42.7 |
| Total | 89 | 100.0 |
| Years of Experience | | |
| < 5 | 35 | 40.4 |
| 5 – 9 | 24 | 27.0 |
| 10 – 15 | 10 | 11.2 |
| > 15 | 19 | 21.3 |
| Total | 89 | 100.0 |
| Type of Education | | |
| International | 21 | 23.6 |
| Regional | 55 | 61.8 |
| Both | 13 | 14.6 |
| Total | 89 | 100.0 |
| Professional Title | | |
| Staff physician | 4 | 4.5 |
| Senior House Officer | 6 | 6.7 |
| Resident | 33 | 37.1 |
| Registrar/Senior Registrar | 27 | 30.3 |
| Consultant | 19 | 21.3 |
| Total | 89 | 100.0 |

**Table 2:** Knowledge statement and percentages of correct answers received by the participants (n=89)

| Statement | Correct Answers (%) |
|---|---|
| GBS is the most common infection associated with complication in fetus | 69 (77.5) |
| GBS can be transmitted to the new-born by vaginal delivery | 79 (88.8) |
| GBS can cause serious complications to the new-born | 80 (89.9) |
| GBS can be asymptomatic during pregnancy | 70 (78.7) |
| Does GBS carrier status is prevalent among pregnant women. | 53 (59.6) |
| Screening of GBS can decrease the prevalence of neonatal complication | 79 (88.8) |
| Screening of GBS during perinatal period can help to start antibiotic during labor | 67 (75.3) |
| Asymptomatic pregnant woman does need to be screened | 37 (41.6) |

| | |
|---|---|
| Patient with previous past history of infection only should be screened | 59 (66.3) |

**Table 3:** Attitude of family medicine physician toward GBS screening (n=89)

| Statement | Strongly Disagree (%) | Disagree (%) | I do not know (%) | Agree (%) | Strongly Agree (%) |
|---|---|---|---|---|---|
| Do you think it is important to do GBS infection screening during pregnancy | 1 (1.1) | 1 (1.1) | 6 (6.7) | 45 (50.6) | 36 (40.5) |
| Do you recommend to screen for GBS infection during pregnancy | 1 (1.1) | 3 (3.4) | 12 (13.5) | 42 (47.2) | 31 (34.8) |
| Do you advice junior staff to do GBS infection screening | 1 (1.1) | 12 (13.5) | 12 (13.5) | 37 (41.6) | 27 (30.3) |
| Do you think pregnant women will get benefit from GBS infection screening | 0 (0) | 0 (0) | 10 (11.2) | 47 (52.8) | 32 (36.0) |
| Do you recommend to do GBS screening in primary health care | 2 (2.2) | 8 (9.0) | 11 (12.4) | 42 (47.2) | 26 (29.2) |

**Table 4:** GBS screening practices among the family medicine physicians (n=89)

| Statement | Yes (%) | No (%) | I do not know (%) |
|---|---|---|---|
| Have you been trained to do GBS infection screening | 27 (30.3) | 59 (66.3) | 3 (3.4) |
| Do you need to be trained to do GBS infection screening | 65 (73.0) | 18 (20.2) | 6 (6.7) |
| Do you screen for GBS infection screening in your clinic | 19 (21.3) | 59 (66.3) | 11 (12.4) |
| Do you fear of complication of doing GBS infection screening | 23 (25.8) | 51 (57.3) | 15 (16.9) |
| Do you train junior staff to do GBS infection screening | 15 (16.9) | 57 (64.0) | 17 (19.1) |
| Do you give antibiotics for GBS infection in pregnancy | 45 (50.6) | 27 (30.3) | 17 (19.1) |

**Table 5:** Barriers to GBS screening as identified by the participated physicians (n=89)

| Statement | Yes (%) | No (%) |
|---|---|---|
| Lack of training | 41 (46.1) | 48 (53.9) |
| Fear of consequences | 13 (14.6) | 76 (85.4) |
| Systems and protocol | 47 (52.8) | 42 (47.2) |
| Lack of tools | 22 (24.7) | 67 (75.3) |
| Other | 15 (16.9) | 74 (83.1) |

**Table 6:** The best fitting model for knowledge score using OLS regression (n=89)

| Variable | $\widehat{\beta}$ | SE* | P-value** | 95 CI† of the coefficient ($\widehat{\beta}$) | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| Constant | 76.1 | 5.8 | <0.001 | 64.6 | 87.6 |
| Age group (30 – 39) vs. Age group (< 30) | 9.4 | 4.5 | 0.039 | 0.5 | 18.2 |
| Age group (40 – 49) vs. Age group (< 30) | 10.3 | 3.8 | 0.036 | 1.8 | 18.9 |
| Age group (≥ 50) vs. Age group (< 30) | 8.9 | 2.6 | 0.040 | 0.4 | 22.6 |

* SE: Standard Error

** P-value is considered statistically significant when it is < 0.05

† CI: Confidence Interval

$R^2$ = 16.8%

AIC = 740

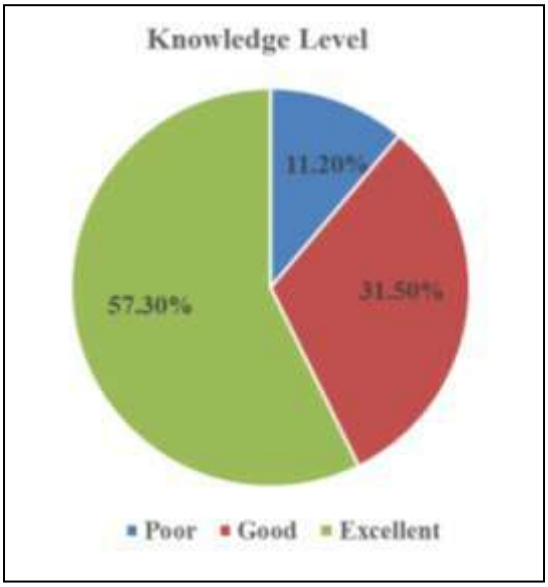


**Fig 1:** Physicians' levels of knowledge about GBS screening categorized by score (n=89)

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