

## Knowledge, Attitude and Practice of Pediatric Physicians toward APGAR Score in Al-Qassim Region

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### Abstract

**Objectives:** This study aimed to assess the knowledge, attitude and practice of physicians who are covering delivery rooms toward APGAR score at the Ministry of Health Hospitals in Al-Qassim province, Saudi Arabia.

**Methods:** This is a cross-sectional study conducted among pediatric physicians at different Ministry of Health Hospitals in Qassim province, Saudi Arabia. A self-administered questionnaire was distributed among the targeted physicians using an online survey. The questionnaire includes socio-demographic data, a questionnaire that assesses knowledge toward APGAR score, and a questionnaire that measures the attitude and practice of APGAR score.

**Results:** Of the 138 pediatric physicians, 63% were males and 38.4% were aged between 36 to 45 years old. The overall mean knowledge score was 6.04 (SD 1.17) out of 7 points. For attitude, the overall mean attitude score was 48.5 (SD 1.72) out of 60 points with nearly all physicians (88.4%) estimated to have a positive attitude, and the rest were neutral (11.6%). Factors associated with increased knowledge were being more experienced, being more educated, and being a consultant while being a resident was the factor associated with increased attitude.

**Conclusion:** The knowledge and attitude of pediatric physicians toward the APGAR score were sufficient. Older physicians who have higher education and years of experience were more likely to demonstrate better knowledge, however, the attitude and practices toward the APGAR scores were more likely demonstrated by the resident physicians. More research is needed to shed more light on the knowledge and attitude of pediatric physicians in our region.

**Keywords:** APGAR Score; Pediatric Physician; Knowledge; Attitude; Practice

### Introduction

Apgar score is a scoring system that was developed by Virginia Apgar in 1952 to assess newborns health status. The scoring system was a method that rapidly assessed the newborn clinical status at 1 minute of age and helped in evaluating if there is a need of an urgent intervention to establish breathing. A list was made of all the objective signs which pertained in any way to the condition of the infant at birth. Of these, five signs which could be determined easily and without interfering with the care of the infant were considered useful.

A rating of zero, one or two, was given to each sign depending on whether it was absent or present. Ten points described the best possible condition with two points each given for respiratory effort, reflex irritability, muscle tone, heart rate and color [1]. In 1958 there was a second report evaluating a larger population [2].

A standardized assessment of neonates after delivery was provided by the APGAR scoring system which included five elements: heart rate, respiration, reflexes, muscle tone, color. A score of 0, 1 or 2 was given to each. Thus, APGAR score takes clinical signs of neonatal depression such as bradycardia, apnea, depressed reflexes, hypotonia, pallor and cyanosis and quantitate them. The score is reported at 1 minute, 5 minutes and at 5 minutes intervals after that if the score is less than 7 up to 20 minutes [3].

Apgar score has been used for more than 50 years as an essential part of newborn assessment, yet there are few studies that discussed the Knowledge, Attitude and Practice of the neonatal health care providers of the importance and implications of the scoring system.

APGAR scoring can be conducted by a nurse, physician, or a midwife. The inter-rater variability is common, using written cases descriptions which were previously published it was found that there is a variation of up to 5 points of the same patient after 96 physicians (52 neonatologist and 44 junior staff) from 12 universities were asked to give a score, in only 1 of all the 12 units all caregivers gave the same score, it was found that there is more variation between neonatologist when compared to junior staff. This variation indicates subjectivity [4].

Neonatal health care providers should have a basic understanding of the Apgar score that a score more than 7 is normal; The infant requires 5 minutes of monitoring if a score is between 4 - 6. A score of less than 3 needs immediate resuscitation.

Apgar score has limitations in its use, such as subjectivity, and low prediction accuracy. But still, be considered one of the parameters that almost every neonatologist looks after, to determine the management plan and intervention as well as to predict the long-term outcome.

Thus, due to lack of certainty and huge subjectivity we initiated this project aiming to explore and assess the knowledge, attitude and practice of pediatric physicians who are covering delivery room toward APGAR score at Ministry of Health hospitals in our region, which will be the first study of its kind.

However, If the limitations are understood and considered with regard to variables such as gestational age, birth weight and easy to access of other methods to assess the sufficiency of neonatal oxygenation the Apgar system can still be relevant predictor of neonatal outcome.

Only by organized teamwork and consistent communication as well as high level of knowledge and awareness among the members of the interprofessional team could the best possible quality of care be achieved [5,6].

### Materials and Methods

This is a cross-sectional study conducted in Al-Qassim region among different Ministry of Health hospitals (Maternity and Children's Hospital (MCH), King Saud Hospital (KSH), Muznib, Badayea and Arrass General Hospitals). The questionnaire was distributed to Pediatric health care providers.

A constructed, adopted and validated self-administered questionnaire including questions about demographic data (age, gender, experience, level of education and category). General questions measuring the practice of pediatric physicians regarding the use of APGAR score, another questions about knowledge and attitude regarding the score (including their recognition of what APGAR score is and its criteria).

Participants selected by convenience sampling with inclusion criteria of any pediatric physician who is covering the delivery room will be included.

Our exclusion criteria include interns, nurses, midwives, and those who couldn't complete the questionnaire for any reason, in addition to those who is not in attending at delivery rooms.

The knowledge of the physicians toward APGAR score has been assessed using a 7-item questionnaire with "yes" coded with 1 and "no/I don't know" coded with 0 were the answer options. The total knowledge score has been calculated by adding all 7 items. A score ranging from 0 to 7 points had been generated, a higher score indicates a higher knowledge of the APGAR score. By using 50% and 75% as the cutoff points to determine the level of awareness, physicians were categorized as having poor knowledge if the score was below 50%, 50% to 75% were categorized as moderate knowledge and above 75% were categorized as good knowledge levels.

The attitude and practice of the physicians toward the APGAR score have been assessed using a 12-item questionnaire with a 5-point Likert scale category ranging from "strongly disagree" coded with 1 to "strongly agree" coded with 5 as the answer options. The total attitude score has been calculated by adding all 12 items. A score ranging from 0 to 12 points had been generated, a higher score indicates a higher attitude toward the APGAR score. By using 50% and 75% as the cutoff points to determine the level of attitude, physicians were categorized as having a negative attitude if the score was below 50%, 50% to 75% were categorized as neutral and above 75% were categorized as positive attitude levels.

Categorical variables were shown as numbers and percentages (%) while continuous variables were presented as mean and standard deviation. The differences in the score of knowledge and attitude in relation to the socio-demographic characteristics of the physicians had been performed using Mann Whitney Z-test and Kruskal Wallis H-test. The normality test was carried out using the Shapiro-Wilk test and Kolmogorov-Smirnov test. The knowledge and attitude scores follow the non-normal distribution. Therefore, the non-parametric tests were applied. Pearson correlation coefficient was also conducted to determine the correlation between the knowledge and attitude score. Two-tailed analyses with  $p < 0.05$  were used as the cutoff for statistical significance. All data analyses were performed using the statistical package for social sciences, version 26 (SPSS, Armonk, NY: IBM Corp, USA).

**Results and Discussion**

A total of 138 pediatric physicians responded to our survey. Table 1 presented the socio-demographic characteristics of the physicians. The most common age group was 36 to 45 years old (38.4%) with nearly two-thirds (63%) being males. Approximately 63.8% of the physicians were non-Saudis. Physicians who had 6 to 10 years in practice constitute 28.3%. Regarding education, 31.2% had master's degrees. With respect to the physician's position, 63% were specialists, and only 16.7% were consultants. All the physicians were knowledgeable of the APGAR score and all of them knew the APGAR criteria.

Study variables	N (%)
<b>Age group</b>	
25 - 35 years	48 (34.8%)
36 - 45 years	53 (38.4%)
46 - 55 years	24 (17.4%)
> 55 years	13 (09.4%)
<b>Gender</b>	
Male	87 (63.0%)
Female	51 (37.0%)

<b>Nationality</b>	
Saudi	50 (36.2%)
Non-Saudi	88 (63.8%)
<b>Years in practice</b>	
< 1 year	12 (08.7%)
1 - 5 years	37 (26.8%)
6 - 10 years	39 (28.3%)
11 - 15 years	25 (18.1%)
> 15 years	25 (18.1%)
<b>Educational level</b>	
Bachelor's degree	26 (18.8%)
Diploma holder	27 (19.6%)
Master degree	43 (31.2%)
PhD degree	11 (08.0%)
Board Certified	25 (18.1%)
Fellowship certificate	06 (04.3%)
<b>Position</b>	
Resident	28 (20.3%)
Specialist	87 (63.0%)
Consultant	23 (16.7%)
<b>Knowledge about APGAR score</b>	
Yes	138 (100%)
No	0
<b>Knowledge about APGAR criteria</b>	
Yes	138 (100%)
No	0

**Table 1:** Socio-demographic characteristics of pediatric physicians (n = 138).

The assessment of physicians' knowledge of the APGAR score was given in table 2. It can be observed that all or most respondents were knowledgeable about the APGAR including the score of each element (100%), the score that requires resuscitation (100%), the exact time when resuscitation is warranted (97.8%), the normal condition based on APGAR score (93.5%), and the inappropriate use of APGAR score (78.3%) while 70.3% and 63.8%, respectively disagreed that APGAR score is objective and the need for resuscitation of baby with APGAR score of 5. The overall mean knowledge score was (6.04 (SD 1.17) with low, average and high knowledge detected in 4.3%, 24.6%, and 71%, respectively.

Regarding attitude and practice (Table 3), all or nearly all physicians indicated higher agreement in 9 out of 12 attitude statements ranging from a mean score of 4.54 to 5 points with 5 points being the highest. However, poor ratings were shown in the remaining attitude statements such as "I am likely to use the APGAR score during my duty if it predicts a neurological outcome" (mean score: 1.96), "I might apply the APGAR score on a newborn if it has low sensitivity" (mean score: 1.43), and "Newborn his heart rate 90 bpm, with shallow breathing, minimal response to stimulation, flexed arms and legs, and blue extremities, the best practice is not to do resuscitation and keep observing" (mean score: 1.23). The overall mean attitude score was 48.5 (SD 0.85) with a positive attitude found in 88.4% and the rest were neutral (11.6%). None of the physicians were categorized as having a negative attitude.

Knowledge statement		Yes	(%)
1.	According to the APGAR score, a score of 0,1 or 2 is given to each element	138	(100%)
2.	According to the APGAR score, a score less than 3 requires resuscitation	138	(100%)
3.	An APGAR score of 0 that remains 0 after 10 minutes of age stopping the resuscitation is warranted	135	(97.8%)
4.	According to the APGAR score, a score of more than 7 consider normal	129	(93.5%)
5.	APGAR score has been used inappropriately to predict adverse neurological outcomes	108	(78.3%)
6.	APGAR score consider being objective †	97 (70.3%)	
7.	In a newborn with a score of 5, Does he/she require resuscitation? †	88 (63.8%)	
Total knowledge score (mean ± SD)		6.04 ± 1.17	
Level of knowledge			
•	Low	06 (04.3%)	
•	Average	34 (24.6%)	
•	High	98 (71.0%)	

**Table 2:** Assessment of physician’s knowledge toward APGAR score (n = 138).  
†: Reversed Coded Question.

Attitude and practice statement		Mean ± SD
1.	In my clinical practice, I am likely to use APGAR score as it is easy to remember	5.00 ± 0.00
2.	I am possibly can use the APGAR score in my clinical practice if it helps in early resuscitation	5.00 ± 0.00
3.	I probably can apply APGAR score if its details are reachable to me	5.00 ± 0.00
4.	Newborn his heart rate is 130 bpm, with good respiratory effort, prompt response to stimulation, active, and appears pink, the best practice is to do routine care	5.00 ± 0.00
5.	I am possible to use the APGAR score in my on-calls duty if it helps me to avoid poor outcome	5.00 ± 0.00
6.	Newborn his heart rate 40 bpm, with no breathing efforts, floppy, hypotonic and appear blue, the best practice is to do resuscitation	4.91 ± 0.29
7.	On my duty, I probably can detect the clinical newborn status if the APGAR score applied	4.82 ± 0.49
8.	According to APGAR score, physician experience is considered a clinical factor	4.63 ± 0.73
9.	I might apply the APGAR score on a newborn if it has high specificity	4.54 ± 0.85
10.	I am likely to use the APGAR score during my duty if it predicts a neurological outcome	1.96 ± 1.50
11.	I might apply the APGAR score on a newborn if it has low sensitivity	1.43 ± 0.85
12.	Newborn his heart rate 90 bpm, with shallow breathing, minimal response to stimulation, flexed arms and legs and blue extremities, the best practice is not to do resuscitation and keep observing	1.23 ± 0.85
Total attitude and practice score (mean ± SD)		48.5 ± 1.72
Level of attitude		
Negative		0
Neutral		16 (11.6%)
Positive		122 (88.4%)
Response has a range from “strongly disagree” coded with 1 to “strongly agree” coded with 5.		

**Table 3:** Assessment of physician’s attitude and practice toward APGAR score (n=138).

When measuring the differences in the scores of knowledge and attitude (Table 4), it was found that a higher knowledge score was more associated with being older in age ( $H = 9.177$ ;  $p < 0.001$ ), gender male ( $Z = 2.371$ ;  $p = 0.018$ ), having more than 10 years in practice ( $H = 17.187$ ;  $p < 0.001$ ), having master’s degree or higher education ( $Z = 5.048$ ;  $p < 0.001$ ), being a consultant ( $Z = 25.758$ ;  $p < 0.001$ ). On the other hand, a higher attitude score was more associated with being a resident ( $H = 6.565$ ;  $p = 0.038$ ). Other socio-demographic variables did not show significant differences when compared to attitude score including age group, gender, nationality, years in practice, and educational level ( $p > 0.05$ ).

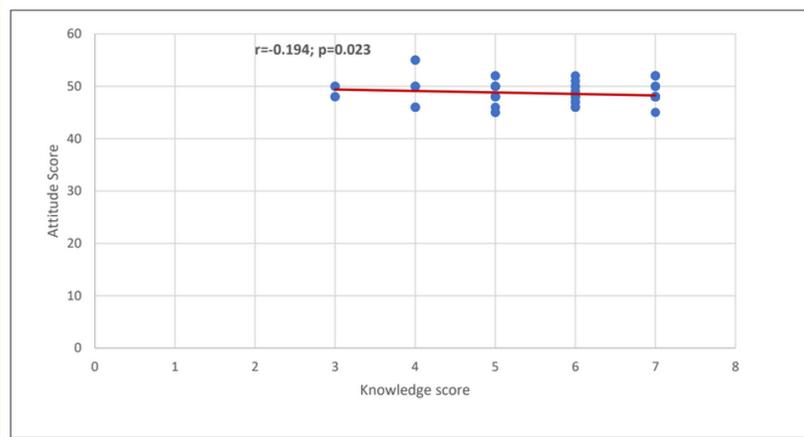
Factor	Knowledge Score (7) Mean ± SD	Z/H-test; P-value	Attitude Score (60) Mean ± SD	Z/H-test; P-value
<b>Age group<sup>a</sup></b>				
25 - 35 years	5.69 ± 1.26	$H = 9.177$ ; $P = 0.010$ **	48.9 ± 2.09	$H = 5.530$ ; $P = 0.063$
36 - 45 years	6.13 ± 1.02		48.2 ± 1.66	
> 45 years	6.35 ± 1.18		48.4 ± 1.06	
<b>Gender<sup>b</sup></b>				
Male	6.21 ± 1.11	$Z = 2.371$ ;	48.3 ± 1.35	$Z = 1.433$ ;
Female	5.75 ± 1.23	$P = 0.018$ **	48.8 ± 2.19	$P = 0.152$
<b>Nationality<sup>b</sup></b>				
Saudi	5.92 ± 1.21	$Z = 0.953$ ;	48.6 ± 1.44	$Z = 1.368$ ;
Non-Saudi	6.10 ± 1.16	$P = 0.341$	48.5 ± 1.86	$P = 0.171$
<b>Years in practice<sup>a</sup></b>				
≤5 years	5.49 ± 1.26	$H = 17.187$ ; $P < 0.001$ **	48.8 ± 2.18	$H = 3.510$ ; $P = 0.173$
6 - 10 years	6.33 ± 0.96		48.2 ± 1.54	
>10 years	6.34 ± 1.06		48.5 ± 1.25	
<b>Educational level<sup>b</sup></b>				
Bachelor’s or diploma	5.45 ± 1.19	$Z = 5.048$ ;	48.7 ± 2.24	$Z = 0.930$ ;
Master’s degree or higher	6.40 ± 1.01	$P < 0.001$ **	48.4 ± 1.29	$P = 0.352$
<b>Position<sup>a</sup></b>				
Resident	5.29 ± 1.12	$H = 25.758$ ; $P < 0.001$ **	49.3 ± 2.54	$H = 6.565$ ; $P = 0.038$ **
Specialist	6.09 ± 1.14		48.4 ± 1.52	
Consultant	6.74 ± 0.86		48.2 ± 0.58	

**Table 4:** Differences in the score of knowledge and attitude in relation to the socio-demographic characteristics of pediatric physicians (n = 138).

a: P-value has been calculated using Kruskal Wallis test.

b: P-value has been calculated using Mann Whitney Z-test. \*\*Significant  $p < 0.05$  level.

In figure 1, it was revealed that there was an inverse significant correlation between the knowledge and attitude score ( $r = -0.194$ ;  $p = 0.023$ ), indicating that the increase in the score of knowledge is correlated with the decrease in the score of attitude.



**Figure 1:** Correlation between the knowledge score and attitude score.

### Discussion

This study examined the knowledge, attitude, and practices (KAP) of pediatric physicians toward the APGAR score. To our knowledge, we viewed that this is the first paper in Saudi Arabia that measured the KAP of pediatric practitioners toward the APGAR score which is an important subject to discuss given the limited findings about physicians’ understanding of the APGAR criteria specifically in our region. Thus, our results could provide some details of this study discipline which could guide our healthcare providers in their future research. The findings of this study revealed that the knowledge of the physicians regarding the APGAR score was deemed adequate. The overall mean knowledge score was 6.04 (SD 1.17) out of 7 points. Our results showed that physicians with a high level of knowledge constituted 71%, 24.6% had average knowledge, and only 4.3% were estimated to have low knowledge levels. This is consistent with the report of Ige., *et al* [7].

Accordingly, they found that there was adequate knowledge and application of the APGAR scoring system by the residents. They also estimated that residents with more years in practice showed significantly better knowledge scores than the residents with the residents who had lower years of experience which was also consistent with our reports.

Data in this study suggest that increasing knowledge was more associated with gender male, increasing age, increasing years in practice, increasing education, and increasing level of the profession. While our study determined that association between the knowledge and socio-demographic variables, on the other hand, in a research conducted among Sudanese nurses and midwives [8] they reported that before the knowledge intervention, nurses and midwives demonstrated no knowledge (0.0%) regarding the information about the uses of the APGAR score, its components, characteristics, and the time of evaluating it, however, after the training program, the proportion of the knowledge increases to 85.7%, 79.6%, 77.6%, and 83.7%, respectively. This indicates that the training program is a powerful method for increasing awareness about the APGAR score and therefore, the educational program is necessitated to enhance the knowledge of healthcare providers.

Regarding the specific knowledge of pediatrician practitioners in their practice of APGAR scores through the clinical setting, physicians were adept at the APGAR scoring criteria (100%), and they were all aware that APGAR scores less than 3 are subjected to resuscitation.

Also, most of them knew that neonates with a prolonged score of 0 up to 10 minutes of age should cease resuscitation (97.8%) while they have shown confidence that a score of more than 7 is considered normal (93.5%). In addition, a great proportion of the physician believed that the APGAR score has been inappropriately used to predict adverse neurological results (78.3%), but they disagreed that it is objective (70.3%) and they also disagreed that a newborn with a score of 5 would require resuscitation. This scenario was similarly documented by Suji and Nishanthlalu [9]. According to reports, despite the scenario that the APGAR score has been used inappropriately among infants to predict specific neurological outcomes, however, three-quarters (75%) of them indicated that the APGAR score can predict an infant's future. They further added that a marginally increased risk for cerebral palsy was associated with a very low 5-minutes APGAR score. Incidentally, according to the systematic review and meta-analysis published in Canada [10] the chance of survival with a 10-minute APGAR of zero was approximately 2 out of 5 neonates, and 1 out of 5 survival rates for those who have moderate to severe impairment neurodevelopmental adding that since the era of therapeutic hypothermia, improvement to survival has increased over the years.

Contradicting these reports, a study conducted among neonatologists in Poland found that 88.5% of neonatologists claimed the use of the Apgar score in assessing newborn health status to be of little value and only 11.5% found this tool useful and reliable [11]. However, in a report by Jurdi., *et al.* [12] where they compared the reliability of the Neonatal Resuscitation Adaptation Score (NRAS) versus the APGAR score, they reported that NRAS demonstrated superior interrater reliability ( $P < 0.001$ ) and respiratory component reliability ( $P < 0.001$ ) for all gestational ages than the Apgar score. Although, the author emphasized further assessment of the tool in the clinical setting to determine its efficacy in providing information to clinicians about the severity of neonatal illness as the case may be.

Most of our respondents (88.4%) demonstrated a positive attitude and practice toward the APGAR score and the rest had a neutral attitude (11.6%). None of the respondents considered having a negative attitude. The overall mean attitude was 48.5 (SD 1.72) out of 60 points. Furthermore, compared to other pediatric physicians, the increase in attitude and practice toward the use of APGAR score can be significantly predicted in resident physicians. No other socio-demographic variables were seen to influence the attitude and practice. Our findings are better than the report of Akbar., *et al.* [13]. Based on their accounts, nurses showed poor practices in the application of APGAR scores for the assessment of newborns in the labor room and they found no significant correlation between the practice of nurses and their socio-demographic data including qualification, years of working in the delivery room, and nursing experience.

Surprisingly, we discovered a significant inverse correlation between the attitude score and the knowledge score. This indicates that the increase in the knowledge of the physicians toward the APGAR scores likely negatively influence their attitude toward using it. This interesting link between knowledge and attitude is subject to further investigation. Thus, a multi-center level of research is needed to determine the true effect of the knowledge and the attitude of healthcare providers when using the APGAR score.

### Conclusion

The knowledge and attitude of pediatric physicians toward the APGAR score were sufficient. Older physicians who have higher education and years of experience were more likely to demonstrate better knowledge, however, the attitude and practices toward the use of the APGAR score were more likely demonstrated by the resident physicians. Continuous education on the appropriate usage of the APGAR score during neonatal resuscitation is necessary to maintain adequate knowledge and its proper application. More research is needed to shed more light on the knowledge and attitude of pediatric physicians in our region.

### Conflict of Interest

The author declares that there is no any financial interest or any conflict of interest exists.

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