Study of comparison between Alvarado scoring system and RIPASA scoring system in clinical diagnosis of acute appendicitis

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Abstract
Background: *Appendicitis is one of the most common gastrointestinal emergencies and appendicectomy is one of the most commonly performed abdominal emergency. Less studies have been cited in the literature regarding the diagnosis of acute appendicitis based on the two (Alvarado and RIPASA) scoring systems.*

Aims and Objectives: *To assess the reliability & practical applicability of the widely used Alvarado and RIPASA scoring system in patients with suspected acute appendicitis.*

Materials and Methods: *60 patients fulfilling the inclusion criteria were included in the study. The study was carried out at DVVPF's Medical College and hospital, Ahmednagar between February 1,2018 to July 1, 2019. Parameters for the study were Alvarado score, RIPASA score and histopathology findings. On arrival of patients in casualty/ surgery department with clinical suspicion of acute appendicitis, both the Alvarado and RIPASA parameters were applied to them. The surgeon who admitted the patient and had taken decision for appendicectomy was asked to fulfil the Alvarado and the RIPASA parameter card using the tick (□) marks. After the procedure of appendicectomy was over Alvarado and RIPASA score was calculated for the same patient for comparison.*

Results: *The most common age group amongst our study population was 21 to 30 years (51.67%) followed by 31 to 40 years (20.00%). According to Alvarado scoring system,the most common symptom was Nausea & vomiting (86.67%), followed by pain migration to RIF (65%) and anorexia (60%). Most common sign was RIF tenderness (100%), followed by rebound tenderness (70%) and fever (18.33%). Raised WBC count was found in 68.33% patients and shift to left in 55% patients. According to RIPASA scoring system, 54 (90%) patients had age ≤39.9 years and 6 (10%) patients had age > 40 years. 59 (98.33%) patients had right iliac fossa pain, 39 (65%) patients pain migration to right iliac fossa was present, 34 (56.67%) patients had anorexia and nausea and vomiting in 51 (85%) patients. Duration of symptoms less than 48 hours was present in 51 (85%) patients, while 9 (15%) patients had duration of symptoms greater than 48 hours. All 60 (100%) patients had RIF tenderness present, while guarding was present in 29 (48.33) patients. 42 (70%) patients had rebound tenderness present, 12 (20%) patients had Rovsing's sign present and fever was present in 11 (18.33%) patients. 41 (68.33%) patients had raised WBC and 56 (93.33%) patients had negative urinalysis. There was no foreign nationals. In our study, 38 (63.33%) patients had Alvarado score ≥7 and 22 (36.67%) patients had Alvarado score < 7. In RIPASA*

scoring system, 55 (91.67%) patients had score ≥7.5 and 5 (8.33%) patients has score < 7.5. The difference was statistically significant with Chi-square value 13.811 and p value 0.0002. With RIPASA score ≥7.5 sensitivity was 96% (CI 86.29-99.51), while Alvarado score ≥7 had sensitivity 68% (CI 53.30-80.48).Diagnostic accuracy of Alvarado scoring system was 66.67% as compared with RIPASA scoring system which was found to be 85.00%.

Conclusion: *The alternative of having additional parameters makes the RIPASA score more flexible and adaptable to different geographical conditions. Looking in terms of healthcare cost savings, the use of RIPASA score may help to reduce inpatient admissions which can be avoided as well as costly radiological imaging investigations.*

Keywords: *Alvarado, RIPASA, scoring system, acute appendicitis.*

Introduction

All over the world, one of the most common gastrointestinal emergencies is appendicitis and one of the most commonly performed abdominal emergency is appendicectomy. [1]

Accurate identification of patients who require immediate surgery as opposed to those who will benefit from active observation is not always easy.[2]

To reduce the negative appendicectomy rates and have accuracy in management of acute appendicitis various methods have been developed. For quick diagnosis and management of acute appendicitis, a number of scoring systems have been used. Various parameters included in these scoring systems include clinical history (pain in RIF, anorexia, nausea and vomiting), physical examination (RIF tenderness, guarding) and laboratory findings (raised WBC count). The Alvarado scoring system advocated for the diagnosis of acute appendicitis is used since 1986 as well as the Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scoring system which is newly evolved one. The Alvarado scoring system has less parameters as compared to the RIPASA scoring system. Parameters such as age, sex, longevity of symptoms before presentation, Rovsing's sign and foreign NRIC (National Registration Identity Card) are included in RIPASA scoring system. Very mearge studies have been cited in the literature regarding the diagnosis of acute appendicitis based on the two (Alvarado and RIPASA) scoring systems.[3]

The present prospective analytical longitudinal study aims to compare Alvarado and RIPASA score by assigning them to the patients coming to our hospital with suspected acute appendicitis.

Aims and Objectives

To assess the reliability & practical applicability of the widely used Alvarado and RIPASA scoring system in patients with suspected acute appendicitis.

To compare sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV) and diagnostic accuracy between Alvarado and RIPASA scoring system in clinical diagnosis of acute appendicitis.

Material and Methods

This prospective analytical longitudinal study was conducted on 60 patients presenting to the Department of General Surgery, to our hospital with suspected appendicitis. The study was conducted at department of surgery in our hospital from February 1, 2018 to July 1, 2019. The inclusion criteria were patients presenting with suspected acute appendicitis, patients of all age group, both sexes (male & female) and patients willing to give written informed consent. The exclusion criteria were patients with right iliac fossa mass, pregnant patients. This study was carried out in Tertiary care hospital. The ethics clearance was obtained from the appropriate authority appointed by the institution (ethics committee). All cases in above mentioned period with suspected appendicitis were selected for the study.

Parameters for the study were Alvarado score, Ripasa score, histopathology findings.

Alvarado score

Fig. No.1: Alvarado score card[4,5]

Symptoms	Score	Score
Pain migration to RIF	1	
Anorexia	1	
Nausea & Vomiting	1	
Signs		
RIF tenderness	2	
Rebound tenderness	1	
Fever	1	
Investigation		
Raised WBC	2	
Shift of WBC to left	1	
Total score	10	

RIPASA Score

Fig. No.2: RIPASA score card[6]

Patients Parameters	Score	Score
Female	0.5	
Male	1.0	
Age ≤ 39.9 yrs	1.0	
Age ≥ 40 yrs	0.5	
Symptoms		
RIF pain	0.5	
Pain migration to RIF	0.5	
Anorexia	1.0	
Nausea & Vomiting	1.0	
Duration of symptoms <48 hrs	1.0	
Duration of symptoms >48 hrs	0.5	
Signs		
RIF tenderness	1.0	
Guarding	2.0	
Rebound tenderness	1.0	
Rovsing's sign	2.0	
Fever>37°C,<39°C	1.0	
Investigations		
Raised WBC	1.0	
Negative urinalysis	1.0	
Additional scores		
Foreign NRIC	1.0	
Total	17.5	

On arrival of patients in casualty/ surgery department with clinical suspicion of acute appendicitis, both the Alvarado and RIPASA parameters were applied to them as shown in the Figs.1 & 2, respectively. The RIPASA score card had 14 parameters, with an extra parameter for patients who had foreign national record of identity card (NRIC). The Alvarado score card included the standard 8 parameters (Fig. 1). The surgeon who admitted the patient and had taken decision for appendicectomy was asked to fulfil the Alvarado and the RIPASA parameter card using the tick (□) marks. The decision of appendicectomy was totally based on surgeon who was admitting the patient based on his clinical opinion. Ultrasonography of abdomen was performed in all the patients which showed features of acute appendicitis. All the patients who were admitted and posted for appendicectomy received standard emergency pre-operative management with intravenous fluids, antibiotic, analgesics and nil by mouth status. Open appendicectomy was done in all patients later on. Operative findings were noted and all pathological specimens were sent to the Pathology department at our hospital. At our hospital, a single senior pathologist conducted histological examinations of all appendicular specimens procured from the emergency appendicectomy to avoid bias. After the procedure of appendicectomy was over Alvarado and RIPASA score was calculated for the same patient for comparison. Microsoft Excel software was used for raw data entry. The numerical data was expressed as mean ± standard deviation and categorical data expressed as frequency. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy was determined with the help of two-by-two contingency table. Student's t-test (independent, two tailed) was applied to parameters with continuous variables so as to compare the differences between the groups. P-value <0.05 was taken as level of significance.

Results

Table No.3: Age distribution amongst study population

Age group	Frequency	Percent
11 to 20 yrs.	11	18.33
21 to 30 yrs.	31	51.67
31 to 40 yrs.	12	20.00
41 to 50 yrs.	5	8.33
51 to 60 yrs.	1	1.67
Total	60	100.00

As seen in the table, the most common age group amongst study population was 21 to 30 years (51.67%) followed by 31 to 40 years (20.00%) and 11 to 20 years (18.33%).

Table No. 4: Sex distribution amongst study population

Sex	Frequency	Percent
Male	28	46.7
Female	32	53.3
Total	60	100

As seen in the table, there were 28 (46.7%) male patients and 32 (53.3%) female patients amongst study population.

Table No.5: Distribution of cases according to Alvarado appendicitis scoring system

Symptoms	Score	No. of patients
Pain migration to RIF	1	39
Anorexia	1	36
Nausea & Vomiting	1	52
Signs		
RIF tenderness	2	60
Rebound tenderness	1	42
Fever	1	11
Investigation		
Raised WBC	2	41
Shift of WBC to left	1	33
Total score	10	60

As seen in the table, the most common symptom was Nausea & vomiting (86.67%), followed by pain migration to RIF (65%) and anorexia (60%). As seen in the table, most common sign RIF tenderness (100%), followed by rebound tenderness (70%) and fever (18.33%). As seen in the table, raised WBC count was found in 68.33% patients and shift to left in 55% patients.

Table No.6: Distribution of cases according to RIPAS Appendicitis (RIPASA) score

Patients Demographic	Score	No. of patients
Female	0.5	32
Male	1.0	28
Age ≤ 39.9 yrs	1.0	54
Age ≥ 40 yrs	0.5	6
Symptoms		
RIF pain	0.5	59
Pain migration to RIF	0.5	39
Anorexia	1.0	34
Nausea & Vomiting	1.0	51
Duration of symptoms <48 hrs	1.0	51
Duration of symptoms >48 hrs	0.5	9
Signs		
RIF tenderness	1.0	60
Guarding	2.0	29
Rebound tenderness	1.0	42
Rovsing's sign	2.0	12
Fever>37°C,<39°C	1.0	11
Investigations		
Raised WBC	1.0	41
Negative urinalysis	1.0	56
Additional scores		
Foreign NRIC	1.0	00
Total	17.5	60

As seen in the table 32 (53.33%) patients were female and 28 (46.67) patients were male. 54 (90%) patients had age ≤39.9 years and 6 (10%) patients had age > 40 years. 59 (98.33%) patients had RIF pain, 39 (65%) patients pain migration to RIF was present, 34 (56.67%) patients had anorexia and nausea and vomiting in 51 (85%) patients. Duration of symptoms less than 48 hours was present in 51 (85%) patients, while 9 (15%) patients had duration of symptoms greater than 48 hours. All 60 (100%) patients had RIF tenderness present, while guarding was present in 29 (48.33) patients. 42 (70%) patients had rebound tenderness present, 12 (20%) patients had Rovsing's sign present and fever was present in 11 (18.33%) patients. 41 (68.33%) patients had raised WBC and 56 (93.33%) patients had negative urinalysis. There was no foreign nationals.

Table No. 7: Distribution of cases according to Alvarado and RIPASA scoring system

	No. of patients (n=60)	Percent	Chi-square value	p value
ALVARADO score			13.811	p=0.0002
≥7	38	63.33		
<7	22	36.67		
RIPASA score				
≥7.5	55	91.67		
<7.5	5	8.33		

As seen in the above table No.5, 38 (63.33%) patients had Alvarado score ≥7 and 22 (36.67%) patients had Alvarado score < 7. In RIPASA scoring system, 55 (91.67%) patients had score ≥7.5 and 5 (8.33%) patients has score < 7.5. The difference was statistically significant with Chi-square value 13.811 and p value 0.0002.

Table No.8: Comparison of mean Alvarado score and mean RIPASA score among all patients

No. of patients	Alvarado score (Mean±SD)	RIPASA score (Mean±SD)	p-value
60	6.9+1.66	9.7+1.49	<0.0001

Table No. 9: Comparison of mean Alvarado score and mean RIPASA score with histological findings of appendix.

Histological finding	No. of patients	ALVARADO score (Mean±SD)	RIPASA score (Mean±SD)	p- value
Acute appendicitis	50	7.06±1.63	9.9±1.35	<0.0001
Normal appendix	10	6.1±1.66	8.8±1.89	<0.003

Table No.10: Distribution of patients according to RIPASA and Alvarado scores

	True positive		False positive	
	Alvarado score ≥7	RIPASA score ≥ 7.5	Alvarado score ≥7	RIPASA score ≥7.5
Male:Female	14:20	23:25	1:3	4:3
No. of patients	34	48	4	7
Mean age ±SD (yrs)	27.56±8.14	28.42±8.34	18.5±4.80	22±9.73
Total score ±SD; range	8.06±0.65; 7.0-9.0	10.04±1.11; 8.0-12.5	7.75±0.96; 7.0-9.0	9.79±1.25; 8.0-11.5

	True negative		False negative	
	Alvarado score < 7	RIPASA score <7.5	Alvarado score < 7	RIPASA score < 7.5
Male: Female	3:3	0:3	9:7	1:1
No. of patients	6	3	16	2
Mean age ±SD (yrs)	28.83±10.09	31±6.93	30.38±8.41	29.5±7.78
Total score±SD; range	5±0.89; 4.0-6.0	6.5; 0	4.94±0.85; 3.0-6.0	6±0.7; 5.5-6.5

Table No.11: Sensitivity of patients subjected to RIPASA and Alvarado score

No. of patients	RIPASA score	Alvarado score	Chi-square value	p-value
True positive	48	34	13.279	p=0.0002
False negative	2	16		
Total patients	50	50		

Table No.12: Differentiation between Alvarado and RIPASA scoring systems with respect to various variables

Sr.No.	Variables	...ado score(%) ≥ 7 (95% CI)	RIPASA score(%) ≥7.5 (95% CI)
1.	Sensitivity	68% (53.30-80.48)	96% (86.29-99.51)
2.	Specificity	60% (26.24-87.84)	30% (6.67-65.25)
3.	Positive predictive value	89.47% (79.54-94.90)	87.27% (81.99-91.17)
4.	Negative predictive value	27.27% (16.40-41.75)	60.00% (22.27-88.70)
5.	Diagnostic accuracy	66.67% (53.31-78.31)	85.00% (73.43-92.90)

Results

In the study, 60 patients were included. Out of which, 28 were male and 32 were female patients. The mean age of all patients was 28.33 ± 8.52 years. Emergency appendicectomy was performed in all 60 patients. 50 cases were positive histologically for acute appendicitis and 10 cases were negative for acute appendicitis. All of them were discharged alive. Grouping of the 60 patients in four groups was done according to the Alvarado score at a cut-off threshold of 7.0 and the RIPASA score at the cut-off threshold score of 7.5 (Table No.10). The Alvarado score ≥7 identified 34 (68%) patients confirmed with histological acute appendicitis as compared to RIPASA score ≥7.5 which correctly identified 48 (96%) patients confirmed with histological acute appendicitis (Table No.11, p= 0.0002). Table No.10 shows that the 16 patients who were missed by the Alvarado score were grouped wrongly into the false negative group with Alvarado score < 7.0.

Alvarado scoring system correctly identified 6 (60%) patients without acute appendicitis with score < 7.0, while the RIPASA scoring system identified 3 (30%) without acute appendicitis and grouped them into the true negative group with score < 7.5. The mean total Alvarado and RIPASA scores for each group are shown in table no.10. Mean total RIPASA score of 48 patients was 10.04 ± 1.11 (range 8-12.5), while mean Alvarado score of 34 patients was 8.06 ± 0.65 (range 7-9) who were grouped as true positive.

Mean total Alvarado score of 6 patients was 5 ± 0.89 (range 4-6), while mean RIPASA score of 3 patients was 6.5 who were grouped as true negative.

Differentiation between Alvarado and RIPASA scoring systems with respect to various variables was measured by sensitivity, specificity, PPV, NPV and diagnostic accuracy as shown in table no.12. With RIPASA score ≥7.5 sensitivity was 96% (CI 86.29-99.51), while Alvarado score ≥7 had sensitivity 68% (CI 53.30-80.48). Diagnostic accuracy of Alvarado scoring system was 66.67% as compared with RIPASA scoring system which was found to be 85.00%.

Discussion

One of the most common surgical emergencies which the surgeons come across is acute appendicitis. Emergency appendicectomy makes up one in ten of all emergency abdominal surgeries.[9,10] It can be difficult at times to correctly diagnose and take quick action on patients of acute appendicitis doing early appendicectomy and avoiding complications arising from perforation.

Radiological imaging techniques such as computed tomography (CT) helps in making a proper diagnosis and have been reported to have high sensitivity (94%) and specificity (95%) for making diagnosis of acute appendicitis.[11] Thus, in many of the hospitals, in all patients of suspected acute appendicitis, it is routine to go for CT imaging.[12] However, such routine practice

of doing CT will increase the cost of healthcare. The process of performing CT imaging may lead to the further delay for emergency appendicectomy. A study has showed that such excessive use of CT imaging may lead to the diagnosis of early low grade appendicitis and performing unnecessary appendicectomies in a patient that would otherwise have resolved spontaneously with conservative antibiotics management.[13]

The most widely used scoring system for acute appendicitis is the Alvarado score which was initially found in 1986. It is a simple additive scoring system to help with the diagnosis of acute appendicitis.[7] Although it has showed very good sensitivity and specificity when used in a western population, several studies have shown its limitation when applied in an Asian population.[14-16] New diagnostic scoring system has been developed for the diagnosis of acute appendicitis known as Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score. The new scoring method has shown to have significantly higher diagnostic accuracy, sensitivity and specificity as compared to the Alvarado or Modified Alvarado scores, when the latter two scores were used in an Asian population. The RIPASA score includes 14 generalized parameters, with an additional parameter Foreign NRIC (National Record of Identity Card). All parameters can be easily obtained from clinical history, examination and laboratory investigation.

In the present study, the most common age group amongst study population was 21 to 30 yrs (51.67%) followed by 31 to 40 yrs (20%) and 11 to 20 yrs (18.33%). Mean age of the patients was 27.52 ± 8.52 years. These findings are in agreement with the study conducted by Mahendra Kumar Regar et al[17] with clinically suspected 100 cases, 91% cases were < 40 years and 9% cases were ≥40 years with mean age of patients 24.86 years. In the studies conducted by Chong CF et al,[8] mean age of the patients was 25.1 ± 12.7 years while the mean age was 27.82 ± 9.262

years of the patients included in the study conducted by Nanjundaiah N et al.[3]

In our study, there was equal number of female (53.3%) and male (46.7%) patients amongst the study population. These findings are in agreement with the study conducted by Chong CF et al[8] in which there was 52.09% females and 47.91% males. In study conducted by Mahendra Kumar Regar et al,[17] there were 61% males and 39% females amongst the study population. In study conducted by Nanjundaiah et al,[3] there were 61.6% males and 38.4% females amongst the study population.

In the present study, 38 (63.33%) patients had Alvarado score ≥7 and 22 (36.67%) patients had Alvarado score < 7. In RIPASA scoring system, 55 (91.67%) patients had score ≥7.5 and 5 (8.33%) patients had score < 7.5. The difference was statistically significant with Chi-square value 13.811 and p value 0.0002. These findings are in agreement with the study conducted by Chong CF et al[8] in which 80 (41.67%) patients had Alvarado score ≥7 and 112 (58.33%) patients had Alvarado score < 7. In RIPASA scoring system, 116 (60.42%) patients had score ≥7.5 and 76 (39.58%) patients had score < 7.5. The difference was statistically significant with Chi-square value 13.51 and p value 0.0002. Our study findings were also in agreement with Mahendra Kumar Regar et al,[17] 65 (65%) patients had Alvarado score ≥7 and 35 (35%) patients had Alvarado score < 7. In RIPASA scoring system, 92 (92%) patients had score ≥7.5 and 8 (8%) patients has score < 7.5. The difference was statistically significant with Chi-square value 21.59 and p value 0.0000033. In the study conducted by Nanjundaiah N et al,[3] 23 (11.1%) patients had Alvarado score ≥7 and 183 (88.9%) patients had Alvarado score < 7. In RIPASA scoring system, 180 (87.4%) patients had score ≥7.5 and 26 (12.6%) patients has score < 7.5.

In our study, emergency appendicectomy was performed in all 60 patients. Confirmed histology

for acute appendicitis was found in 50 (83.33%) patients, while negative histology for acute appendicitis was found in 10 (16.67%) patients. These findings are in agreement with the study conducted by Chong CF et al[8] where confirmed histology for acute appendicitis was found in 101 (77.1%) patients, while negative histology for acute appendicitis was found in 30 (22.9%) patients. Our study findings were also consistent with findings of study conducted by Nanjundaiah N et al[3] in which confirmed histology for acute appendicitis was found in 184 (89.3%) patients, while negative histology for acute appendicitis was found in 22 (10.6%) patients. In the study conducted by Mahendra Kumar Regar et al,[8] confirmed histology for acute appendicitis was found in 95 (95%) patients, while negative histology for acute appendicitis was found in 5 (5%) patients.

In a retrospective study, the RIPASA score has achieved superior sensitivity (88%) and specificity (67%) as compared to the Alvarado score (sensitivity 59%, specificity 23%).[6] In a prospective study conducted by Chong CF et al,[8] RIPASA score had better sensitivity (98%) and specificity (81%) as compared to the Alvarado score (sensitivity 68%, specificity 88%) in an Asian population. In another prospective study conducted by Nanjundaiah et al,[3] RIPASA score had better sensitivity (96.2%) and specificity (90.5%) as compared to the Alvarado score (sensitivity 58.9% , specificity 85.7%). In study conducted by Mahendra Kumar Regar et al,[17] RIPASA score had better sensitivity (94.74%) and specificity (60%) as compared to the Alvarado score (sensitivity 67.37% , specificity 80%). In our study, RIPASA score had better sensitivity (96%) and specificity (30%) as compared to the Alvarado score (sensitivity 68%, specificity 60%). In terms of accurately diagnosing patients with acute appendicitis (sensitivity and diagnostic accuracy), the RIPASA score is superior than the Alvarado score.

Table No.13: Comparison of variables between various studies

Study group	Our study		Chong CF et al		Nanjundaiah N et al		Mahendra Kumar Regar et al	
	R	A	R	A	R	A	R	A
Sensitivity	96%	68%	98.02%	68.32%	96.2%	58.9%	94.74%	67.37%
Specificity	30%	60%	81.32%	87.91%	90.5%	85.7%	60%	80%
Positive predictive value	87.27%	89.47%	85.34%	86.25%	98.9%	97.3%	97.83%	98.46%
Negative predictive value	60.00%	27.27%	97.37%	71.43%	73.1%	19.1%	37.5%	11.43%
Diagnostic accuracy	85.00%	66.67%	91.83%	86.51%	98.2%	84.9%	93%	68%

In our study, 96% of patients who actually had acute appendicitis, using the RIPASA score, were correctly diagnosed and placed in the high probability group (RIPASA score ≥7.5) and managed appropriately, compared to only 68% when using the Alvarado score on the same patients. In study conducted by Chong CF et al,[8] the patients placed in the high probability group of RIPASA ≥7.5 belonged to 98% of patients who actually had acute appendicitis and were correctly diagnosed, and managed accordingly as compared to only 68.3% when using the Alvarado score on the same number of patients.

The difference in the diagnostic accuracy between the Alvarado score and RIPASA score in our study 18.33% was significant, which indicates that the RIPASA score is a much superior diagnostic tool for the diagnosis of acute appendicitis. In our study, patients who were classified in the low-probability group, i.e. true negative group with

RIPASA score < 7.5 and Alvarado score < 7, the RIPASA score once again surpassed the Alvarado score by correctly diagnosing 60.0% of patients which did not have acute appendicitis, compared with the Alvarado score, which only managed to correctly diagnose 27.27% of patients. In Chong CF et al,[8] difference between diagnostic accuracy of RIPASA score and Alvarado score was 5.32% which was statistically significant (p< 0.0001). For patients of low probability group, i.e. true negative group, the RIPASA score correctly diagnosed 97.4% patients who did not have acute appendicitis, compared with the Alvarado score which managed to correctly diagnose 71.4%. In the study conducted by Nanjundaiah N et al,[3] the difference in the diagnostic accuracy between the RIPASA score and Alvarado score was 13.4% which was significant. In another study conducted by Mahendra Kumar Regar et al,[17] the difference in the diagnostic accuracy between the RIPASA score and Alvarado score was 25% which was significant.

The RIPASA score requires only the patients characteristics (age, sex and nationality, which are all available on registration), better clinical evaluation (right iliac fossa pain, pain migration to right iliac fossa, anorexia, nausea and vomiting), signs (right iliac fossa tenderness, rebound tenderness, guarding, Rovsing's sign and fever) and two investigations (raised white blood cell count and negative urinalysis which is defined as an absence of red and white blood cells, bacteria and nitrates) due to which it is a useful, rapid diagnostic tool for acute appendicitis, in the settings of the emergency. Thus, in an emergency setting, the casualty medical officer can make a quick decision upon seeing patients with RIF pain, by referring those with a RIPASA score ≥7.5 to the on-call surgeon for admission, while patients with a RIPASA score <7.0 can either be conservatively managed in the ward or discharged with an early week appointment. The use of a score also accentuates the working relationships between the casualty officer and the on call surgeon, as any patient with a RIPASA score ≥7.5 needs to be admitted in the hospital.

Conclusion

To conclude, the RIPASA score is at present a much better scoring system for diagnosis of acute appendicitis as compared to the Alvarado score, with the former establishing significantly higher sensitivity, Negative predictive value and diagnostic accuracy. The 14 generalized parameters can be easily and readily obtained in any population setting by taking a detail clinical history, conducting a good clinical examination and just two simple laboratory investigations (WBC count and urinalysis). The alternative of having additional parameters makes the RIPASA score more flexible and adaptable to different geographical conditions. Looking in terms of healthcare cost savings, the use of RIPASA score may help to reduce inpatient admissions which can be avoided as well as costly radiological imaging investigations.

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