Assessment of Knowledge of Pediatric Resident Doctors About Neonatal Pain

Numan Nafie Hameed *, Bassam H. Sweedan **

ABSTRACT:

BACKGROUND:

Infants including newborn babies, experience pain similarly and probably more intensely than older children and adult. They are also at risk of adverse long term effects on behavior and development, through inadequate attention towards pain relief in early life. However, the issue of analgesia in young babies has been largely neglected in most clinical setting, despite subjecting them to painful diagnostic and therapeutic procedures.

OBJECTIVE:

To assess the knowledge of resident doctors regarding neonatal pain and to compare this with best evidence-based medicine.

SUBJECTS & METHODS:

A survey study questionnaires was distributed to pediatric resident doctors (PRD) in three training hospital centers in Baghdad (A- Al-Kademia teaching Hospital, B- Child central teaching hospital, and C- Children Welfare teaching hospital/ medical city) during the period from first of February to first of May, 2010. The questions were about the doctors` knowledge in treatment of pain in neonates, specifically regarding the perception and the effects of pain, pain assessment tools, and the safety and efficacy of treatments for both procedural and long-term pain.

RESULTS:

This study included 101 PRD, 29 were females and 72 were males. Doctors generally knew about efficacy of skin to skin contact and massage , breast feeding and oral sucrose during short term procedures, benefit and risk of use of morphine and midazolam, but less agreed that sedation does not necessarily provide adequate pain relief into neonates. Doctors were supporting use of topical anesthetic agents but not supporting the benefit of treating long term pain with opioid analgesic outweigh the risk of neonates. About half of PRD knew the difference in long term effect between neonates and older children. Pain assessment tools were not perceived to be reliable ,valid or routinely used.

CONCLUSION:

The knowledge of resident doctors regarding neonatal pain was inadequate when compared with developed countries studies and evidence based medicine, so we recommend to increased the educational programs and training on neonatal pain management.

KEY WORDS: assessment, knowledge, pediatric resident doctors, neonatal pain.

INTRODUCTION:

Despite increased awareness of the importance of pain prevention, neonates in the neonatal intensive care units continue to be exposed to numerous painful minor procedures daily as part of their routine care. Although there are major gaps in our knowledge regarding the most effective way to prevent and relieve pain in neonates, proven and safe therapies are currently underused for routine minor yet painful procedures [(1)].

Pain appears inadequately treated in many units and countries. Better compliance with published guidelines is needed for clinical and ethical reasons [(2)].

Anecdotally, there is impression in new Zealand, Australia and Italy that neonates undergo minor diagnostic and therapeutic procedures and may even undergo major procedures without analgesic support. We postulate that this practice continues because healthcare workers may be unaware of the fact that neonates feel pain and of treatment modalities available for relief of this pain. The authors therefore reviewed the current understanding of pain assessment and

*Department of Pediatric - College of Medicine- Baghdad University.

**Children Welfare Teaching Hospital- Medical City Complex- Baghdad.

management and crafted a questionnaire to determine current practice. Evaluation of the knowledge, perception and practice of healthcare workers regarding neonatal pain management is the first step in determining present barriers that exist to appropriate pain management in neonates [3,4,5,6] .

This study aimed to assess the knowledge of pediatric resident doctors in three training pediatrics teaching hospitals in Baghdad, Iraq, regarding neonatal pain and to compare this with best evidence based medicine.

SUBJECTS AND METHODS:

This survey study utilized a questionnaires containing 13 questions about management of neonatal pain. The survey was conducted during the period from first of February to first of May, 2010 and distributed to 101 pediatric resident doctors(PRD) who were postgraduate students for fellowship of Iraqi and Arab board and they received 3 months /year for 4 years as neonatal training in three training teaching hospital centers in Baghdad(A- Al-Kademia teaching Hospital, B- Child central teaching hospital, and C- Children Welfare teaching hospital/ medical city). The questions were about doctors knowledge and treatment of pain in neonates, specifically regarding the perception and the effects of pain, pain assessment tools, and the safety and efficacy of treatments for both procedural and long-term pain. [1,6] Analysis of data was performed according to gender(female or male),number of years of experience as physician categories(less than 10 and 10 or more), number of years of study in pediatric specialty categories(first year and second year and third-forth year), hospital training centers (A, B and C) and lastly according to total correct knowledge score-categories(less than 3 , 3-4.9 , 5 or more). [1,6] Statistical analyses were done using SPSS version 13 computer software (Statistical Package for Social Sciences). Frequency distributions for selected variables were done first. The main outcome variable for the present study is total knowledge score, which is a quantitative normally distributed variable, described by arithmetic mean, SD (standard deviation) and SE (standard error). The statistical significance of difference in mean between 2 groups was assessed by independent samples, while between more than 2 groups ANOVA test was used. P value less than the 0.05 level of significance was considered statistically significant.

The association between 2 categorical variables was assessed by Chi-square test of independence. The high knowledge score category was defined as the fourth quartile group.

RESULTS:

This study included 101 PRD, 29(28.7%) were females and 72(71.3%) were males. The physician Experience categories was less than 10 years in 69 (68.3%) and ten years and above in 32 (31.7%). The number of years in pediatric study was 23(22.8%) in the1st years, 29(28.7%) in 2nd years & 49(48.5%) in 3rd and final years. The total correct knowledge score categories from 10 was less than 3 in 21(20.8%), 3 - 4.9 in 44(43.9%) and 5 or more in 36(35.6%).

The relative frequency of PRD who correctly agreed on positive answers was highest for question 4 (skin to skin contact & massage sufficiently reduce the pain experienced by neonate during short term procedures) & question 5 (breast feeding & oral sucrose sufficiently reduce the pain experienced by neonate during short term producers)(62.4% and 57.5% respectively). All remaining questions (1, 2, 3) were correctly agreed at percentage less than 40%.(Table 1)

The relative frequency of PRD who correctly disagreed on negative answers was highest for (morphine infusion should always be used in neonates who are ventilated)(59.4%), followed by (midazolam is safe for routine use in neonate)(48.5%), (pain in neonatal period does not have any long term effect) (46.5%), (neonates are less sensitive to painful stimuli than adult) (45.6%), and(sedation provide adequate pain relief in neonates) (32.7%) (less than 40%) . (Table 2)

Two questions (1.Topical anaesthesia such as EMLA(lidocaine – prilocaine cream) should always be used prior to performing venipuncture or placing a catheter in a neonate), (2. The benefit of treating long term pain with opioid analgesics out-weigh the risks in neonates) were attitudinal in nature (personal opinion, or controversies) with no correct or incorrect agree answer, about 2/3 of PRD (63.4%) agreed on question 1, while only one fifth (19.8%) agreed on question 2. (Table 3)

Significantly higher percentage of females (55.2%) had correct knowledge for(pain assessment tools for neonates are liable and valid) compared to males (30.6%). Male gender decrease the risk of correct knowledge in this question by 3 times. An obviously higher proportion of males (54.2%) had correct knowledge on (midazolam is safe for routine use

in neonate) compared to females (34.5%), but the difference observed failed to reach the level of statistical significance. Male gender decrease a risk of having correct knowledge by 2.2 times compared to female depend on OR. The other percentages of PRD with correct knowledge showed no important or statistically significant differences between males and females. (Table4)

The percentages of PRD with correct knowledge showed no important or statistically significant difference between < 10 years & 10 years or more (years of experience as physician categories).(Table 5)

The proportion of PRD with correct knowledge on (midazolm is safe for routine use in neonate) was lowest for those of first year (21.7%) compared to second year & 3rd + final years (55.2%) and (57.1%) respectively. The association between years of study & knowledge on this question was statistically significant. The levels of correct knowledge in remaining question showed no important or statistically significant association with years of study. (Table 6).

Regarding the knowledge of PRD groups in 3 Teaching hospitals, (35.3%) of PRD A had correct knowledge on (skin to skin contact and massage sufficiently reduce the pain experienced by neonate during short term procedures) compared to PRD B (76.5%) & PRD C (75.8%). The association between PRD groups & knowledge on this question was statistically significant. The same things for (neonate are more likely to experience long term consequence) was lowest for PRD B (14.7%) compared to PRD A (29.4%) &PRD C (54.5%). The same thing for (midazolm is safe for routine use in neonate) was lowest for PRD A (26.5%) compared to PRD B (61.8%) & PRD C(57.6%). The level of correct knowledge in remaining questions show no statistically significant association with PRD groups. (Table 7)

Female gender had an obviously higher knowledge score (44.8%) compared to males (31.9%) (not significant statistically). Male gender decrease the rise of high knowledge by 1.8 times compared to female. The difference between answers of PRD depended on number of years as physician categories or pediatric specialty categories was not significant statistically. PRD C had an obviously higher rate for high knowledge score (48.5%) compared to PRD B (35.5%) & PRD A (25.5%). So being trained in PRD C group increase the chance of having high knowledge score by 3.06 times compared to PRD A (Table 8). The mean total correct knowledge score was significantly higher in PRD C (5/10) & lowest in PRD A.

A mean total correct knowledge score had no statistically significantly association with number of years of experience as a physician or pediatric specialty. (Table 9)

DISCUSSION:

The issue of analgesia in young babies has been largely neglected in most clinical setting, despite subjecting them to painful diagnostic and therapeutic procedures. This is the first study to assess the knowledge of Iraqi PRD regarding neonatal pain.

Regarding (skin to skin contact and massages sufficiently reduce the pain experienced by neonate during short term procedures),[7,8] (62.4%) of PRD were aware of this fact in this study. In Australia study, less than half were aware of this[4,5].This high awareness in this study is a result of increase learning time required for clinical staff to learn this experience (especially PRD C compared to PRD A (75.8%, 35.3% respectively).

Regarding (Breast feeding and oral sucrose sufficiently reduce the pain experienced by neonates during short term procedures) [9], (57.5%) of our PRD were aware of this. In Australia and Italy studies were(65%,70% respectively). All studies have high scores about this question. [4,5,6]

Regarding the question (Pain assessment tool for neonate are reliable and valid) [10,11], (37.6%) of our PRD were aware of this question, while in Studies in Australian and Italy were (11%, 19% respectively) [4,5,6]. All studies have low percentages and need to have theoretical and practical sessions to understand tools for assessment of neonatal pain.

Regarding (Effective pain management in neonate has been shown to reduce mortality and morbidity) [3,12], in this study correctly agree were(35.6%),while in Australia and Newzealand studies were(70%, 65% respectively)[3,4,5]. The low percentage of this study may be due to deficiency of theoretical and practical information regarding this issue, like American academy of pediatrics guidelines for pain management [1].

Regarding the question (Untreated pain in neonatal period caries the risk of long term effect) [13], especially in preterm neonate who are more likely to experience long term consequences from painful experience than older children[14], (54.5%)of PRD C were correctly

agree compared to PRD B and PRD A (14.7% and 29.4% respectively), while in Australia & Italian study were (55%, 89% respectively)[4,5,6]. The low percentages in PRD B and A may be due to deficiency in practical application for this item.

Regarding (pain assessment tools in caring for neonate routinely used) [10,11] ,our PRD give (32.7%) correctly agree, Australian and Italian studies were (20%,34%respectively)[4,5,6].So low percentage of studies because of decrease in practical teaching that demonstrating clinical utility of pain assessment tools.

Regarding (morphine infusion should always be used in neonate who are ventilated),[15,16], in this study (59.4%) correctly disagree,(66.7%) of PRD C compared to PRD A (44.1%). In Australian and Italian studies were (67%, 64% respectively) [4,5,6]. This study give high score (except PRD A which need education). According to evidence based medicine, morphine infusion may be considered in ventilated neonate, but on the basis of clinical judgment rather than routinely used.[1]

Regarding (midazolam is safe for routine use in neonate)[17,18], (48.5%)of PRD in this study correctly disagree (PRD B (61.8 %) compared to PRD A (26.5%) and PRD C (57.6%). In Australian and Italian studies were (21% and 33% respectively).[4,5,6]. This low score in this study(especially PRD A suggest that information on harm of midazolam use in neonate was not sufficient.

Regarding (pain in neonatal period does not have any long term effect) [19,20,21], (46.5%)of our PRD correctly disagree ,PRD C were (51.5%) compared to PRD A (38.2%). In Australian and newzeland studies were (82%, 89% respectively).(4,5,6) This study give defect in earlier education of PRD on this subject (especially in PRD A).

Regarding (neonates are less sensitive to painful stimuli than adults) ([22,23]), this study were (45.5%) correctly disagree , PRD B,C (52.9%, 48.5% respectively) compared to PRD A (35.3%). In Australian and newzealand studies the result were (90%).[3,4,5]. This low score in this study due to decrease in medical information (especially in PRD A). According to base evidence medicine , neonate and especially premature neonate are more sensitive to painful stimuli than adult. [23]

Regarding(sedation provide adequate pain relief in neonate) [22,24], our PRD were (32.7%) correctly disagree. In Australian study were (76%). This study give defect in earlier education of PRD on this subject. it has been claimed that sedation masks pain response in neonate. [22]

Regarding (topical anesthesia such as EMLA(lidocaine – prilocaine cream) should always be used prior to performing venepuncture or placing catheter in a neonate) [25,26], this question is attitude (controversial), and till now there is no evidence based medicine to this statement. Our PRD were (63.4%) agree. In Australia and Italian studies were (10% , 12% respectively)[4,5,6]. EMLA can be used with simple surgical procedures like intra muscular injection, lumber puncture [26], but not for venepuncture or placing catheter.[25]

Regarding (the benefit of treating long term pain with opioid analgesics outweigh the risks in neonate), our PRD were (19.8%) agree. In Australian study (39%) agree[4,5]. This is also attitude question and there is no evidence to support this routine use, because opioid have adverse neurological effect.[15,16] .

Table 1: Rate of correct knowledge for selected questions in which the correct answer is positive agreement.

Question	Disagree		Correctly Agree		Don't know		Total	
	N	%	N	%	N	%	N	%
Effective pain management in neonate reduces mortality and morbidity	44	43.6	36	35.6	21	20.8	101	100
Pain assessment tools for neonate are reliable and valid	44	43.6	38	37.6	19	18.8	101	100
I routinely use pain assessment tools in caring for neonates	45	44.6	33	32.7	23	22.8	101	100
Skin to skin contact and massage sufficiently reduce the pain experienced by neonate during short term procedures	23	22.8	63	62.4	15	14.9	101	100
Breast feeding and oral sucrose sufficiently reduce the pain experienced by neonates during short term procedures	31	30.7	58	57.4	12	11.9	101	100

Neonate are more likely to experience long term consequences from painful experiences than older children	34	33.7	33	32.7	34	33.7	101	100

Table 2: Rate of correct knowledge for selected questions in which the correct answer is disagreement.

Questions	Correctly Disagree		Agree		Don't know		Total	
	N	%	N	%	N	%	N	%
Sedation provides adequate pain relief in to neonates	33	32.7	57	56.4	11	10.9	101	100
Midazolam is safe for routine used in neonate	49	48.5	23	22.8	29	28.7	101	100
Neonate are less sensitive to painful stimuli than adult	46	45.5	29	28.7	26	25.7	101	100
Pain in the neonatal period does not have any long term effect	47	46.5	24	23.8	30	29.7	101	100
Morphine infusion should always be used in neonates who are ventilated	60	59.4	19	18.8	22	21.8	101	100

Table 3: The personal opinion for 2 controversial questions.

Questions	Disagree		Agree		Don't know		Total	
	N	%	N	%	N	%	N	%
Topical anaesthesia such as EMLA cream should always be used prior to performing venepuncture or placing acatheter in a neonate	26	25.7	64	63.4	11	10.9	101	100
The benefit of treating long term pain with opioid analgesics out-weigh the risks in neonates	56	55.4	20	19.8	25	24.8	101	100

Table 4: The rate of correct knowledge in selected questions by gender.

Questions	Gender					
	Female (n=29)		Male (n=72)			
	N	%	N	%	95% CI	P (Chi-square)
Correctly agree						
1. Effective pain management in neonate reduces mortality and morbidity	12	41.4	24	33.3	(0.29 - 1.72)	0.45[NS]
2. Pain assessment tools for neonate are reliable and valid	16	55.2	22	30.6	(0.15 - 0.87)	0.021
3. I routinely use pain assessment tools in caring for neonates	11	37.9	22	30.6	(0.29 - 1.78)	0.48[NS]
4. Skin to skin contact and massage sufficiently reduce the pain experienced by neonate during short term procedures	19	65.5	44	61.1	(0.34 - 2.04)	0.68[NS]
5. Breast feeding and oral sucrose sufficiently reduce	15	51.7	43	59.7	(0.58 - 3.3)	0.46[NS]

the pain experienced by neonates during short term procedures						
6. Neonate are more likely to experience long term consequences from painful experiences than older children	13	44.8	20	27.8	(0.19 - 1.16)	0.1[NS]
Correctly disagree						
7. Sedation provides adequate pain relief in to neonates	10	34.5	23	31.9	(0.36 - 2.22)	0.81[NS]
8. Midazolam is safe for routine used in neonate	10	34.5	39	54.2	(0.92 - 5.5)	0.07[NS]
9. Neonate are less sensitive to painful stimuli than adult	15	51.7	31	43.1	(0.3 - 1.68)	0.43[NS]
10. Pain in the neonatal period does not have any long term effect	17	58.6	30	41.7	(0.21 - 1.21)	0.12[NS]
11. Morphine infusion should always be used in neonates who are ventilated	15	51.7	45	62.5	(0.65 - 3.72)	0.32[NS]

NS=Not Significant.

Table 5: The rate of correct knowledge in selected questions by categories of number of years of experience as a physician.

Questions	Number of years of experience as a physician-categories					
	<10 (n=69)		10+ (n=32)			
	N	%	N	%	95% CI	P (Chi-square)
Correctly agree						
1. Effective pain management in neonate reduces mortality and morbidity	24	34.8	12	37.5	(0.47 - 2.69)	0.79[NS]
2. Pain assessment tools for neonate are reliable and valid	26	37.7	12	37.5	(0.42 - 2.36)	0.99[NS]
3. I routinely use pain assessment tools in caring for neonates	20	29	13	40.6	(0.7 - 4.03)	0.25[NS]
4. Skin to skin contact and massage sufficiently reduce the pain experienced by neonate during short term procedures	43	62.3	20	62.5	(0.42 - 2.4)	0.99[NS]
5. Breast feeding and oral sucrose sufficiently reduce the pain experienced by neonates during short term procedures	37	53.6	21	65.6	(0.69 - 3.94)	0.26[NS]
6. Neonate are more likely to experience long term consequences from painful experiences than older children	22	31.9	11	34.4	(0.46 - 2.72)	0.8[NS]
Correctly disagree						
7. Sedation provides adequate pain relief in to neonates	26	37.7	7	21.9	(0.18 - 1.22)	0.12[NS]
8. Midazolam is safe for routine used in neonate	34	49.3	15	46.9	(0.39 - 2.1)	0.82[NS]
9. Neonate are less sensitive to painful stimuli than adult	29	42	17	53.1	(0.67 - 3.63)	0.3[NS]
10. Pain in the neonatal period does not have any long term effect	31	44.9	16	50	(0.53 - 2.84)	0.63[NS]
11. Morphine infusion should always be used in neonates who are ventilated	44	63.8	16	50	(0.24 - 1.33)	0.19[NS]

NS=Not Significant

Table 6: The rate of correct knowledge in selecte ns by categories of number of years of study in pedia alty.

Questions	Number of years of study in pediatric specialty-categories						
	First year (n=23)		Second year (n=29)		3rd & 4th year (n=49)		
	N	%	N	%	N	%	P (Chi-square)
Correctly agree							
1. Effective pain management in neonate reduces mortality and morbidity	12	52.2	10	34.5	14	28.6	0.15[NS]
2. Pain assessment tools for neonate are reliable and valid	11	47.8	8	27.6	19	38.8	0.32[NS]
3. I routinely use pain assessment tools in caring for neonates	5	21.7	14	48.3	14	28.6	0.09[NS]
4. Skin to skin contact and massage sufficiently reduce the pain experienced by neonate during short term procedures	14	60.9	17	58.6	32	65.3	0.83[NS]

5. Breast feeding and oral sucrose sufficiently reduce the pain experienced by neonates during short term procedures	13	56.5	18	62.1	27	55.1	0.83[NS]
6. Neonate are more likely to experience long term consequences from painful experiences than older children	9	39.1	7	24.1	17	34.7	0.48[NS]
Correctly disagree							
7. Sedation provides adequate pain relief in to neonates	11	47.8	9	31	13	26.5	0.19[NS]
8. Midazolam is safe for routine used in neonate	5	21.7	16	55.2	28	57.1	0.014
9. Neonate are less sensitive to painful stimuli than adult	11	47.8	10	34.5	25	51	0.36[NS]
10. Pain in the neonatal period does not have any long term effect	15	65.2	13	44.8	19	38.8	0.11[NS]
11. Morphine infusion should always be used in neonates who are ventilated	10	43.5	18	62.1	32	65.3	0.2[NS]

Ns=Not Significant

Table 7: The difference in rate of correct knowledge in selected questions between the 3 PRD groups.

Questions	Training Centers and PRD Groups						
	PRD A (n=34)		PRD B (n=34)		PRD C (n=33)		
	N	%	N	%	N	%	P (Chi-square)
Correctly agree							
1. Effective pain management in neonate reduces mortality and morbidity	17	50	7	20.6	12	36.4	0.04
2. Pain assessment tools for neonate are reliable and valid	18	52.9	7	20.6	13	39.4	0.022
3. I routinely use pain assessment tools in caring for neonates	13	38.2	10	29.4	10	30.3	0.7[NS]
4. Skin to skin contact and massage sufficiently reduce the pain experienced by neonate during short term procedures	12	35.3	26	76.5	25	75.8	<0.001
5. Breast feeding and oral sucrose sufficiently reduce the pain experienced by neonates during short term procedures	18	52.9	20	58.8	20	60.6	0.8[NS]
6. Neonate are more likely to experience long term consequences from painful experiences than older children	10	29.4	5	14.7	18	54.5	0.002
Correctly disagree							
7. Sedation provides adequate pain relief in to neonates	12	35.3	11	32.4	10	30.3	0.91[NS]
8. Midazolam is safe for routine used in neonate	9	26.5	21	61.8	19	57.6	0.006
9. Neonate are less sensitive to painful stimuli than adult	12	35.3	18	52.9	16	48.5	0.32[NS]
10. Pain in the neonatal period does not have any long term effect	13	38.2	17	50	17	51.5	0.49[NS]
11. Morphine infusion should always be used in neonates who are ventilated	15	44.1	23	67.6	22	66.7	0.08[NS]

NS=Not Significant, PRD=Pediatric Resident Doctor.

Table 8: The risk of having high knowledge score (5+) by selected independent variables.

	449				
	Total	High knowledge score (5+)			
	N	N	%	95% CI	P (Chi-square)
Gender					0.22[NS]
Female	29	13	44.8		
Male	72	23	31.9	(0.24 - 1.4)	
Number of years of experience as a physician-categories					0.25[NS]
<10	69	22	31.9		
10+	32	14	43.8	(0.7 - 3.94)	
Number of years of study in pediatric specialty-categories					0.56[NS]

First year	23	9	39.1		
Second year	29	8	27.6		
3rd & 4th year	49	19	38.8		
PRD Groups					0.10[NS]
A	34	8	23.5		
B	34	12	35.3		
C	33	16	48.5		

NS=Not Significant, PRD=Pediatric Resident Doctor.

Table 9: Total correct knowledge score.

	Total correct knowledge score					
	Range	Mean	SD	SE	N	P
Gender						0.13[NS]
Female	(1.8 - 7.3)	4.8	1.5	0.28	29	
Male	(1.8 - 7.3)	4.3	1.4	0.16	72	
Number of years of experience as a physician -categories						0.7[NS]
<10	(1.8 - 7.3)	4.4	1.4	0.17	69	
10+	(1.8 - 7.3)	4.5	1.4	0.25	32	
Number of years of study in pediatric specialty - categories						0.88[NS]
First year	(1.8 - 7.3)	4.6	1.5	0.31	23	
Second year	(1.8 - 7.3)	4.4	1.3	0.23	29	
(3-4)	(1.8 - 7.3)	4.5	1.5	0.21	49	
PRD						0.009
A	(1.8 - 6.4)	4	1.3	0.22	34	
B	(1.8 - 7.3)	4.4	1.5	0.25	34	
C	(1.8 - 7.3)	5	1.3	0.23	33	

NS=Not Significant, PRD=Pediatric Resident Doctor.

CONCLUSION:

The knowledge of resident doctors regarding neonatal pain was inadequate when compared with developed countries studies and evidence

based medicine, so we recommend to increased the educational programs and training on neonatal pain management.

REFERENCES:

1. American academy of pediatrics, Committee on Fetus and Newborn, Section on Surgery, and Section on Anesthesiology and Pain Medicine and Canadian pediatric society, Fetus and Newborn Committee. Prevention and Management of Pain in the Neonate: An Update. Pediatrics 2006; 118:2231-41.
2. Valentina Losacco, Marina Cuttini, Gorm Greisen, Dominique Haumont, Carmen R .Pallás-Alonso, et al. Heel blood sampling in European neonatal intensive care units: compliance with pain management guidelines. *Arch Dis Child Fetal Neonatal Ed* 2011;96:F65–F68.
3. Heaton P , Herd D , Fernando A , Herd D, Fernand A . Pain relief for simple procedures in new Zealand neonatal units ractice change over six years . J . paediatr . Child Health 2007; 43:394-7.
4. Gray PH , Trotter JA , Langbridge P , Doherty CV . Pain relief for neonates in Australian hospital : A need to improve evidence – based practice. J . Paediatr . Child Health 2006;42:10-13.
5. Harrison D, Loughnan P , Johnston L , Harrison D , Loughnan P, Johnston L . Pain assessment and procedural pain management practices in neonatal units in Australia. J. Paediatr Child Health 2006;42: 6-9.

6. Lago P , Guadagni A, Merazzi D et al . Pain management in the neonatal intensive care unit : A national survey in Italy . Paediatr . Anaesth . 2005;15:925-31.
7. Johnston CC , Stevens B , Pinelli J et al . Kangaroo care is effective in diminishing pain response in preterm neonates .Arch . Pediatr . Adolesc .Med .2003;157:1084 -88.
8. Belliieni CV , Cordelli DM , Marchi S et al . Senseorial saturation for neonatal analgesia . Clin . J . Pain 2007; 23: 219 -21.
9. Shah PS , Aliwalas LI , Shah V . Breastfeeding or breast milk for procedural pain in neonates . Cochrane Database Syst . Rev 2006;3: CD004950 .
10. Spence K , Gillies D , Harrison D ,Johnston L , Nay S . A reliable pain assessment tool for clinical assessment in the neonatal intensive care unit .J. Obstet . Gynecol . Neonatal . Nurs .2005 ; 34: 80 -86.
11. Hummel P , Puchalski M , Creech SD , Weiss MG . Clinical reliablity and validity of the N-pass : Neonatal pain , agitation and sedation scale with prolonged pain . J . Perinatol . 2008;28:55-60 .\
12. Anand KJ. Clinical importance of pain and stress in preterm neonates. Biol . Neonate. 1998;73 : 1-9.
13. Porter FL , Grunau RE , Anand KJ . Long – term effects of pain in infants .J . Dev . Behave . Pediatr. 1999;20 : 253 -61.
14. Anand KJ , sippell WG , aynsley – green A . Randomized trial of fentanyl anesthesia in preterm neonates undergoing surgery : Effects on the stress response . Lancet 1987; I: 243 – 48.
15. Bellu R , DE Wall KA , Zanini R . Opioids for neonates receiving mechanical ventilation . update of cochrance Database Syst. Rev . 2005;1:CD004212 .
16. Anand KJ , Hall RW , Desai n et al . Effects of morphine analgesia in ventilated preterm neonates : primary outcomes from the neopain randomized trial. Lancet 2004;363:1673 – 82.
17. Ng E , Tadio A , Ohlsson A . Intravenous midazolam infusion for sedation of infants in the neonatal intensive care unit . update of Cochrane Database Syst . rev . 2000;2: CD002052.
18. Aranda JV , Cario W , Hummel P , Thomas R , Lehr VT , Anand KJ . Analgesia and sedation during mechanical ventilation in neonates . Clin . Ther . 2005;27: 877 – 99.
19. Giannakoulopoulus X , Sepulveda W , kourits P , et al . Fetal plasma cortisol and beta – endorphin response to intrauterine needling . Lancet 1994;344 :77 – 81.
20. Fitzgerald M . Developmental biology of inflammatory pain . Br J Anaesth 1995;75 :177 – 85 .
21. Noerr B . Sucrose for neonatal procedural pain . Neonatal Network 2001;20: 63 – 67.
22. Anand KJ; International evidence – based group for neonatal pain. Consensus statement for the prevention and management of pain in the newborn . Arch . Pediatr . Adolesc . med . 2001;155: 173-80 .
23. Hellerud BC , Storm H . Skin conductance and behaviour during sensory stimulation of preterm and term infants . Early Hum . Dev . 2002;70:35-46 .
24. Hall RW , Boyle E , Young T , Hall RW , Boyle E , Young T . Do ventilated neonates require pain management ? . Semin . Perinatol . 2007;31:289 – 97.

451

`addio A , Ohlsson A , Einarson TR , Stevens B , Koren G . A systematic review of lidocaine – prilocaine cream (EMLA) in the treatment of acute pain in neonates . Pediatrics 1998;101:e1.

26. Weise KL , Nahata MC. Emla for painful procedures in infants .j. pediatr . Health Care 2005;19: 42-7.