Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/12659
DOI URL: http://dx.doi.org/10.21474/IJAR01/12659

ISSN NO. 2320-5407

RESEARCH ARTICLE

A STUDY TO EVALUATE THE EFFECTIVENESS OF WARM SALINE WATER APPLICATION ON PAIN RESPONSE DURING HEELPRICK AMONG NEWBORN AT NICU, GOVERNMENT RAJAJI HOSPITAL, MADURAI

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Manuscript Info

Manuscript History
Received: 05 February 2021
Final Accepted: 10 March 2021
Published: April 2021

Key words:-
Warm Salinewaterapplication, Heel Prick, Newborn

Abstract

Objectives: To assess the level of painresponse during heel prick among newborn.To evaluatetheeffectivenessofwarmsalinewaterapplicationonpainresponseduringheelprickamongnewborn.Toassociatethepainresponseduringheelprickamongnewborn at NICU, Government Rajaji Hospital, Madurai with their baseline variables.
Hypotheses: There isa statistically significant difference betweenthe post test levelof pain response during heel prick among newborn both in intervention and controlgroup.Thereisastatisticallysignificantassociationbetweenthelevelofpainresponse during heel prick among newborn at NICU with their baseline variables.**Conceptual framework:** Roy's adaptation model.
Methodology: True experimentalresearchdesignwasused,60samplesselectedby Simplerandomsamplingandintervention given 2 minutes before heel prick. Post test was assessed by NeonatalInfantPainScale.**Results:**Thestudyrevealedthattherewasasignificantreductionin level of pain response during heel prick (**t=1.25, p=0.21)** at 0.05 level.
Conclusion: Statistical evidence shows that warm saline during heel prick was effective.

CHAPTER – I
INTRODUCTION

a) "Theaimofthewiseisnottosecurepleasurebuttoavoidpain"

-Aristotle

The Lord gives the babies to remind us of the preciousness of life and thefragility of theyoung. Parents find themselves without instructions as well as theresponsibility to raise their God given gift. Babies are born helpless and demanding,theyexpecttobecomfortedwhetherwithfood,affection,ordryclothingimmediately.

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Babies are beautiful gifts from god. An infant or baby is the very youngoffspring of humans. A newborn is an infant who is within hours, days, or up to a fewweeks from birth. In medical contexts, newborn or neonate refers to an infant in thefirst28daysoflifei.e(frombirthupto4weeksafterbirth)lessthanamonthold.The term "newborn" includes premature newborn, post mature newborn and full termnewborns. The arrival of a newborn baby into the family causes immense joy to theparents. At the same time they also experience a lot of anxiety about the well-being ofthe new familymember.

When having a baby, parents don't like to imagine their child needing to stayin the neonatal intensive care unit. Babies who may have difficulty at birth includethose born prematurely, those who experienced a difficult delivery, and those withbirthdefects.Maternalillness,suchas diabetes,highbloodpressure,andinfection, can also lead to problems after birth The main reasons for NICU / /ICUadmissionarelow-birthweight,pretermbirthandrespiratoryproblems;lengthofstaydepends on the severity of the newborn's condition. Fortunately for these babies needspecial care.

The neonatal intensive care unit (NICU) is a specialized care unit in a hospitalthatprovidesahigh-levelofintensivecareforprematurebabiesandthosewithmedical problems. The NICU combines advanced technology and trained healthcareprofessionals to provide specialized care for the tiniest patients. NICUs may also haveintermediateorcontinuingcareareasforbabieswhoarenotassickbutneedspecialized nursingcare.

Researchstatingthatnewborn'spainsensingsystemwasnotyetfullydeveloped, and that they had fewer pain-receptor cells and nerves than children andadults. Support for the theory also came from noticing that while newborns do cryafter blood tests and other painful events, they can also cry in a very similar way fromjust beingmoved, or cryforno reason at all.

However, it has become clear over the last decade that newborns do feel painand that their crying from pain is different to "reflex" crying. It is also clear that verypainfulexperiencesaresomehowrememberedbybabies.Researchhasrecentlyshown that single, very painful experiences such as circumcision operations donewithoutpainkillersresultinthebabyhavingexaggeratedresponsestolaterlesspainful experiences such as routine immunizations. This lasts for many months andsome suggest that it may last for years, although there is no evidence for this. Becauseof this new realization about the importance of pain-relief for babies, newborns arenowroutinelygivenpainkillersformost,ifnotallpainfulprocedures(althoughnotforimmunizations).

Every newborn baby is frequently undergone painful procedures in severalsituations,liketheneedforscreening,diagnosis,andtreatment.Evidencesuggeststhat babies are feeling the pain and they may be more sensitive to pain and long-termeffects, even greater than older children, and they may actually have a 30% to 50%lower pain threshold thanadult.

Babiesareabletointerpretthepainfrom24-28weeksofpregnancy,post-conceptional age, all receptors associated with pain modulation arepresent andresponsive; thus,the fetusand newborn can feel pain. Premature infantsand terminfantslessthan6monthsoldmayhaveimmatureinhibitorypathwaysandthusexperience greater discomfort because they are unable to "gate" painful sensations.Physiologic maturity at different gestational ages affects pharmacokinetics of analgesicdrugs. Although it may not be feasible to eliminate all pain, the goal should be to reduceit to the lowest level possible. Newborns can feel all different sensations, but respondmost enthusiastically to soft stroking, cuddling and covering. Gentle rocking back andforth often calms a crying infant, as do massages and warm baths. Infants cry as a formof basic instinctive communication. A crying infant may be trying toexpress a varietyof feelings includinghunger, discomfort, wanting somethingor loneliness

Untilthelate1970s,itwasbelievedthatbabiesarenotabletofeelthepaindue to insufficient myelinated sensory nerves and prematurity of the pain receptors, sosurgeriesonbabiesandchildrenweredonewithouttheuseofanesthesiaandanalgesics.Butresearcheshaveshownthatever yinfantisabletounderstand,experience and remember the pain, and also babies due to the lack of descendingcontrol system, which is effective in modulating pain, are more sensitive than adultsand moreprone to receive the effects of pain.

Newborns are more sensitive to pain than adults and are more susceptible tothe long-term complications of pain. A challenging issue in the realm of neonatal careis procedural pain management.In the past, whether infants feel pain and how paincan be decreased inthem were inconspicuous.Much evidence suggested that earlyand prolonged exposure to painful stimuli before the development of the nervoussystem, can lead to permanent behavior changes. In addition to the various problems,experiencing the pain in infants can be associated with an increased risk of variouscomplications; pain is one of the multiple causes of ventricles bleeding in newborns.The release of stress hormones due to the absence of pain control, can also lead todelayedwoundhealing,infection,increasedhospitalizationandevendeathinnewborns.

Paincancausephysiologicalchangessuchasincreasedheartrateandbreathing,sweating,skinredness,decreasedoxygensaturation,dilatedpupils,restlessness that if not controlled, they will have numerous effects on different bodysystems and life of babies including, cardiovascular, pulmonary, gastrointestinal andimmunesystemproblems,orcauserestlessness,lossofappetite,incontinence,restlessness, insomnia, nutritional problems, hypoxia, metabolic changes, nocturnalpanic, a delay in recovery , long period of hospitalization, worsening the child's illnessor even death. Moreover, its psychological effects can also be impaired learning andmemory,andpsychologicaldiseasesthatoccur inthefuture.Itisobviousthateffectivepainmanagementisanimportantindicatorofthequalityofcareprovidedto neonates, not only from an ethical standpoint, but also in terms of protecting thelong-term outcome.

Neonatescannotexpresstheirpainandprotectthemselveslikeadults.Moreover,medicaltreatmentinitiallyhasastrongfocus onsavingtheirlives,accepting that well-being is only secondary. Inadequate pain management in neonatallife impairs the neurodevelopment outcome. It alters pain thresholds, pain and stress-relatedbehavior,andphysiologicresponsesinlaterlife.Sincethereareconcernsabout side effects, non-pharmacological interventions have been recently establishedto relieve the pain of different procedures.

According to the International Association, Pain is a physical sensation and anunpleasant experience resulting from actual or potential tissue damage. Although paincannot be precisely monitored, it is considered as an important component of neonatalcare.Paincontrolisofgreatimportance;painmanagementmethodsincludepharmacological and non-pharmacological interventions.

Heel prick is one of the most common procedures carried out in newborns inboth sick and well newborns. Though it is considered to be moderately painful, thecumulative pain due to a heel prick could be tremendous, making pain reductionduring this procedure an urgent priority, using non-pharmacological procedures asmuch as possible. Various devices such as needles and lancet are used for heel prick.Nurses perceive that lancet may be more painful although there is no evidence tosupport this claim owing to the paucity of published data on whether lancet or needleis less painful for heel prick.

Today, non-pharmacological pain relief techniques have attracted the attentionof nurses and physicians. This type intervention is effective, simple, and safe and doesnot require to be performed at certain times using costly equipment. In contrast topharmacological interventions, non-pharmacological methods of pain relief do nothave any side effects. In terms of efficacy, non-pharmacological methods can bedividedintoa)sensorystimulation(changingsituation,swaddle,non-nutritivesucking, and music), b) nutritional intervention, and c) parent involvement in the formofbreastfeeding,skintoskincontact,andKangaroomothercare.SkincontactthroughKangaroomothercarecanreduceenergyconsumptionbyrestoringthenatural heat and can directly or indirectly play a role in soothing pain in infants.Despite its simplicity and efficiency, thisapproach is notalwaysavailable, or ifavailable, is not applicable at all painful procedures. With regards to the fact that painmanagement in infants is an undeniable responsibility of nursing professionals, andconsidering the limited studies on the application of heat in the management of pain ininfants, we sought to measure the effect of heat therapy on infants through non-humansources on paincontrol duringpainful procedures.

The non-pharmacologic measures merit further exploration, as most of theseexploit physiologic mechanisms of pain relief, thus alleviating the possible adverserisksofpharmacologicalpainrelief.Thisdoesnotmeanthatpharmacologicalmeasures should never be used; instead, there should be a high threshold in turning toanalgesics onlyafter non-pharmacological measures are exhausted.

Non-pharmacological methods of pain relief include heat, changing position,swaddle, limiting movement, hugging, shaking, music, reduction of environmentalstimuli, skin contact and non-nutritive sucking. Mechanisms of heat effects on painrelief are due to breaking muscle spasms and the resulting pain relief or increasing theflexibilityof connective tissue.

Touching,holding,stroking,keepingwarm,talkingandsinging/musicareways in which adults have been comforting babies since the start of human history.This way of managing pain is shared with other primates, where the actions areperformedboth byfemale and male adults.It works to reduceanxietyanddistress, butits effect on actual physical pain is less certain. This has been found in children whoare able to verbalize pain, and it is assumed to be true of neonates. While the hurt of aprocedure may not bemuch reduced,thefearis visibly reduced.Therefore it isconsideredgoodpracticetoinvolveparentsorcare-giversdirectlywiththehandlingof the baby, and to have them present and directly in contact with the baby wheneverpossible.

Full-term infants exposed to short-term pain early in life have an increasedresponsetolaterpainfulprocedures.Inaddition,painanticipationmayoccurininfants who are repeatedly exposed to noxious stimuli. The health care practitionersprovideeffectiveinterventionstomanageinfant'spaintohelpconveycomfortandaid in the prevention of long-lasting effects that are potentially harmful to the overallhealth of theinfant.

An intervention that is natural, cost-effective and has no ill-effects would beideal for use in primary care settings for infants receiving heel prick. Research hasshown that warmth is a natural and effective intervention to decrease pain perceptionin infants duringpainful situations

Warm water is one of the oldest forms of alternative therapy, and there's goodreason why this practice has stood the test of time. Warm water can be so helpful infighting the pain. So, it is necessary to use procedures for reducing pain in newborns.The aim of this study was to determine the effect of local warmth by warm salinewateron the painresponseof heel-blood sampling in the term newborns

Admission to the neonatal intensive care unit (NICU) increases the newborn'sexposure to inevitable procedures causing pain. Health care personnel are aware ofpaincausedbyproceduresandtheirspecificanalgesicmanagement.This,however,does not seem to be reflected in practice. The pain caused during these procedures tobemanagedbypharmacologicmeasuressuchasopioidsandsedativesornon-pharmacological measures such as kangaroo mother care, administration of breastmilk, warmth and sucrose solution.

The members of the NICU team work together with parents to develop a planof care for high-risk newborns. Each baby is in an incubator or heatedcot to keeptheir body at the right temperature. There may also be equipment such as a ventilatorto help with breathing, machines to deliver fluids and medicines via tubes in theirveins,andmonitorsattachedtothebaby'sbodytochecktheirheartrate,breathingrate and oxygen level in their blood. Premature or sick newbornsrequiring advancedmedical proceduresare routinelysubjected to painful procedures

Needfor the Study

Admissionratesareincreasingfornewbornsofallweightsatneonatalintensive care unit(NICU) in theUnited States, raising questions about possibleoveruse of this highly specialized and expensive care in some newborns, Few studieshave looked beyond very low-birth-weight infants admitted to the NICU to examinehow neonatal care relates more broadly to newborn care. A 2003 revision to the U.S.Standard Certificate of Live Birth includes a new field to indicate whether a newbornwas admitted to the NICU, which allows researchers to study trends in neonatalintensive care for the majority of the places in U.S. From 2007 to 2012,NICUincreasingly admitted term infants of higher birth weights and by 2012, nearly half ofallNICUadmissionswerefornormal-birth-weightinfantsorforthosebornat37 weeksgestation or older, accordingto the results.

Neonates in the Neonatal Intensive Care nursery experience multiple, painful,tissue-damaging procedures daily. Pain among neonates is often underestimated anduntreated,producinguntowardconsequences.Inonestudy,prematureinfantsexperienced anaverageof 12 painful procedures per dayof hospitalization.

According to a report, inadequate assessment of pain in babies is a persistent,unresolved problem that has serious implications for effective pain management. Itwas believed for years that babies are unable to feel pain and therefore assessment andmanagementofpainwasnotpartofroutinecareafterdelivery.Howeversuchmisconceptions have been quashed by the surge of evidence based data which showedthat critically ill babies often have several types and sources of pain and discomfort. Ithas been documented that hospitalized babies can face upto 400 painful procedurewhiletheyarebeingcaredforinNICU.Themostcommonpainfulprocedureperformed daily are heel lancing, venipuncture and endotracheal intubation. Anothermostcommonprocedureperformedinbabiesisimmunization.Thereshouldberecommendations for improvements in neonatal nursing practice, specially regardingpainassessmentandtheuseofnon-pharmacologicalmethodsduringpainfulprocedures in neonatalclinical settings.

Morespecifically,thestudyreportsthatin2012therewere43 NICUadmissionsper1,000normal-birth-weightinfants(2,500to3,999grams),whilethe admission rate for very low-birth weight infants (less than 1,500 grams) was 844.1per 1,000 live birth.

A survey reported that 151 neonates for the first 14 days after admission to anICUweresubjectedtoanaverageof14painfulproceduresperday.AUniversity

Hospital in Sao Paulo assessed four neonatal units for 1 month in 2001 and found anaverageof 3 to 5 potentiallypainful procedures per infant perday.

A longitudinal study showed that the youngest preterm neonates undergo anaverage of 750 procedures during their hospital stay. Premature infants in CanadianNeonatal Intensive Care Units (NICU) were subjected to an average of two and up toeight painful procedures per day. For these infants, analgesic agents were provided inonly6.8% ofall procedures.

A recentcohort study showed that less than 10% of the sickestof NICUinfants received opioids compared to 22–33% of those at lesser risk for neurologicimpairment. Growing evidence shows that early pain experiences in newborn infantsmay have long-term consequences and, yet, have only been minimally monitored inpublished studies and explain that early pain experiences have long-term squeal isprovided in two parts: the long-term perseverance of central nervous system changesfollowingpainfulinsultsintheveryyoungorganismand,similarly,long-termchanges in responsiveness of the neuro endocrine and immune systems to stress atmaturity.

Nurses may squeeze the heel to obtain an adequate amount of blood sampling,thus causing hemolytic and contamination of the blood sample, which sometimesincreases the need for repeat testing. Bruising caused by heel squeezing during heellancing has also been associated with increased pain for neonates during subsequentheellancing,andhasbeenreportedtobeequallypainfulorevenmorepainfulthanthe actual heel lance itself.

A study demonstrated that infants who were exposed to repeated (more than 5)painfulneedlepuncturesonthefirstday oflifeshowedagreaterpainresponseduringlater needle punctureswhen compared withneonates who had beenexposed toafewer number of needle punctures. It also appears that altered pain perception haslong-term consequences in some vulnerable neonates, which may include cognitiveand behavioral deficiencies.

However,therehasbeenverylittleresearchtodetermineanatural,cost-effective intervention to pain perception in the infant population. Breastfeeding is anintervention that incorporates those qualities, and has ability to decrease infant's painperceptions. Nurse practitioners should use this evidence to encourage breastfeedingmothers to use the act of nursing their infants as a distraction to the pain produced byroutineimmunizationsinthe primarycaresetting.

Admissiontothe NICU isinfluencedby physiologic compromise andbyhospital care protocols. Providing appropriate care must be balanced with adverseconsequences of NICU admission, such as interrupting maternal-infant bonding andunnecessaryinterventions.

Every year, four million newborn babies die in the first month of life - 99% inlow and middle-income countries. India carries the single largest share (around 25-30%) of neonatal deaths in the world. Neonatal deaths constitute two-thirds of infantdeaths inIndia; 45%of the deaths occur within the first two days of life.

It has been estimated that about 70% of neonatal deaths could be prevented ifproven interventions are implemented effectively with high coverage. It was furtherestimated that health facility-based interventions can reduce neonatal mortality by23-50% indifferentsettings.Facility-basednewborncare,thus,hasasignificantpotential for improvingthe survival of newborns inIndia.

Topreventthecomplications,earlyfindingsdoneby someinvestigationsthrough blood samples.Neonatal pain response and adverse effects and maternalanxiety were assessed in 27 infants who were randomly allocated to venepuncture orheel stick. Pain was assessed by nurses using the Neonatal Infant Pain Scale (NIPS)andathreepointscaleforthemothers.NIPSscoreswerehigherintheheelstickgroup compared with the venepuncture group. Maternal anxiety was higher before theprocedure while perception of an infant's pain was lower in the venepuncture groupcompared with the heel stick group. Venepuncture is less painful than heel stick innewborn infants undergoingroutine blood sampling.

Approximately in an average 540 newborn admitted per month for care andtreatmentinGovernmentRajajiHospital, Madurai.Inthatapproximately 20-30babies under goes heel prick per day for various blood sampling. The present studyproposes to determine the effectiveness of warm saline water on pain response amongnewborns. Thereforefrom the above findings the researcher felt that it is a need toconductthepresentstudytoevaluatetheeffectivenessofwarmsalinewaterapplication onpain response duringheel prickamongnewborn.

Statement of the Problem

A study to evaluate the effectiveness of warm saline water application on painresponse during heel prick among newborn at NICU, Government Rajaji Hospital,Madurai

ObjectivesoftheStudy:-

1. Toassessthelevelofpainresponseduringheelprickamongnewbornat NICU, Government RajajiHospital, Madurai.
2. Toevaluatetheeffectivenessofwarmsalinewaterapplicationonpainresponse during heel prick among newborn, both in Intervention Group andControlGroup at NICU,Government RajajiHospital,Madurai.
3. To associatethepain response during heel prick among newborn atNICU,GovernmentRajaji Hospital,Madurai, withtheirselectedbaselinevariables.

Hypotheses

H_1: There is astatistically significantdifferencebetween the post testlevel of painresponse during heel prick among newborn, both in InterventionGroupandControlGroupatNICU, GovernmentRajajiHospital,Madurai.

H2: There is astatistically significant association between the level of painresponse during heel prick amongnewborn atNICU, Government RajajiHospital,Madurai with theirselected Baselinevariables

OperationalDefinitions

Effectiveness

In this studyeffectiveness refers to a change in the level of pain during heelprickafterimplementationoftheintervention(Warmsalinewaterapplication) to theIntervention group which is elicited throughNeonatalInfantPain Scale.

Warmsalinewaterapplication

In this study warm saline water application refers to applying warm salinewater(40^oC) soaked sterile gauze padfor two minutes to the preferred legbeforeheelprickamongnewborn belongingtoInterventiongroup.

Painresponseduringheelprick
Inthisstudypainresponseofnewborndurингheelprickreferstotheunpleasant response or a feeling of discomfort associating with painful stimuliof puncturing the heelby lancetto withdraw blood sample which is assessedbytheNeonatalInfant Pain Scale

Newborn
In this study newborn refers to babies within the age of 0-28 days who isadmitted in NICU for care and treatment and advised to draw blood samplebyheel prick.

Assumptions
Newbornwillhavevaryinglevel ofpainresponseduring heelprick
The warm saline water application will reduce the level of pain during heelprick.

Delimitations
1. Thestudywaslimited to
2. Newbornwhowas admittedinNICU
3. Datacollectionperiod was3-6months

ProjectedOutcome
Thewarmsalinewaterapplication will helpstoreducethelevelof painresponseduringheelprick amongnewborn.

Review Of Literature
CHAPTER – IIREVIEWOFLITERATURE
Review of literature is traditionally understood as a systematic and criticalreviewof mostimportant scholarlyliteratureona particulartopic.

Anextensivereviewofliteraturedonebytheinvestigatorlaidabroadfoundation for thestudyand chapter is divided into four parts.
1. Literaturerelatedtotheeffectivenessofwarmsalineapplication
2. Literaturerelatedto effectivenesswarmsalinewaterapplication onpain
3. Literaturerelatedtoincidenceofheelprickamongnewborn
4. Literaturerelatedtowarmapplicationpainresponseduringheelprick

Literaturerelatedtoeffectivenessof WarmSalineWaterApplication
Anup K Satpathy, et. al., (2017), conducted a comparative study on EfficacyofWarmSalineandChlorhexidineMouthRinsesinthePreventionofAlveolarOsteitis after Third Molar Surgery: A Comparative Study in hospital from Sambalpur,Odisha.110 samples were instructed to gargle with chlorhexidine and 110 samples togargle warm saline. The study was analyzed by Pearson chi square. The study resultedthat overall prevalence of Alveolar Osteitis was 19.4 % and concluded that warmsalinemouth rinse is equallyaseffective aschlorhexidine rinse. (p=0.127)

Amjad Al-ississ (2016), conducted a study onEffect of Warm Saline onBleedingduringSinusandSeptumSurgeryatKingHusseinHospital,KingHussein

Medical City (KHMC), Amman, Jordan included 100 patients, of both males andfemales, aged 28-58years, classedI andII.Patientswereassigned using sealedenvelopes into two groups: group I (n=50): patients received warm saline of up to 48Degree Celsius (DC) during surgery for packing and irrigation and group II (n=50):patients received room temperature normal saline of up to 20 DC, with the use ofvasoconstrictors (in functional endoscopic sinus surgery and septorhinoplasty) andmicro debriders (only in functional endoscopic sinus surgery). This study resulted thatBlood loss was 201.43 ml in group I, 257.34 ml in group II. The study concluded thattheadministrationoftopicalwarmsalineofupto50DCattainedasignificantdecreasein blood loss and duration of surgery

Stewart M,Levey E,Nayyer N. **(2015),** conducted a Randomised controlledtrial on Salt water mouthwash post extraction reduced post operative complications inUniversity of Dundee, Dundee, Scotland, UK.Group A (n = 40) were instructed togargle sixtimes daily with warm saline andgroup B (n =40) twice daily;group C(n = 40) were not

instructed to gargle with warm saline and served as controls. Therewas a statistically significant difference between the study groups with respect to thedevelopment of alveolar osteitis ($\chi 2 = 15.43$, df = 2, P = 0.001), but not for acuteinflamed socket, with only 2.5% of the saline groups (2 out of 80) developing alveolarosteitis compared with 25% (10 out of 40) in the control group. The study concludedthat use of warm saline mouth rinse is beneficial in the prevention of alveolar osteitisafter dental extractions.

Hastings -Tolsma MT., et. al., (2013), conducted a study on Effect of warmand cold applications on the resolution of I.V. infiltrations in University of SouthernMaine,Portland.18healthyadultsbetween20and45yearswereincluded.Warmversuscoldapplicationswererandomlymadetoanintentionalintravenousinfiltrateof5mLofadesignatedsolutionwereexamined.Threesolutionswereused:1/2 saline (154 mOsm), normal saline (308 mOsm), and 3% saline (1027 mOsm).There was no difference in remaining infiltrate when 1/2 saline or normal saline wereused, but a significant ($p < 0.001$) difference was found with 3% saline. For allsolutions there was a significant ($p < 0.001$) difference in the volume of infiltrateremaining when warmth was applied and this effect held across MRI readings andsolutions.The study concluded that Pain intensity did not differ by treatment but asignificant ($p < 0.005$) difference was found by solution, with 3% saline producing thegreatest difference.

WesleyHSelf,StephenJwhite(2013),conductedapilotcrossoverrandomized controlled trial on Warming Intravenous Fluids forImproved PatientComfort in the Emergency Department, Nashville, Tennessee enrolled 27subjects,sequentiallyreceivedbolusesofbodytemperature(36°C)androomtemperature(22°C) IV fluid, with the order of bolusesrandomized.Level of discomfort wasassessedpriortoandaftereachbolus,visualanalogscale(DiscomfortVAS).Treatment with body temperature IV fluid was associated with a significant decreasein discomfort ($p = 0.001$). This study concluded that, infusing IV fluids warmed tobody temperature was associated with improved comfort compared to standard, roomtemperature IV fluids.

B. Fomete,B. D. Saheeb, **et. al., (2004),** conducted, A Prospective ClinicalEvaluationoftheEffectsofChlorhexidine,WarmSalineMouthWashesandMicrobialGrowthonIntraoralSuturein BeninTeachingHospital,BeninCity,Nigeria.Therewere49femalesand51males,intheagerangebetween18and50years.Patientswererandomisedinto3groups(A,BandC).Thecontainerusedhad 34 chlorhexidine, 34 warm saline and 32 warm water mouth rinses. The latterservedascontrol.Allparticipantsineachgroupdidnotreceiveantibioticsbutreceivedanalgesics(paracetamol1 g8 hfor5 days,).Thestudyconcludedthat Chlorhexidine, warm salt water and warm tap water averagely produced the samenumber of colony forming units of bacteria, which shows that the three differentmouth washes are equallyeffective as post-operative mouth rinses after oral surgery

Literature related to effectiveness warm saline water application onpain

KhalilOudaet.al.,(2016),conductedaQuasiexperimentaldesign(randomizedcontrolledtrialdesign)ontheeffectofheatsalineapplicationonrelieving dysmenorrheal pain among young females. The subjects included in thestudy were between 18-25 years with primary dysmenorrhea selected from femalegirls at faculty of Nursing, Menoufia University. Simple random sample was used toselecttheparticipantsofthisstudy,totalsamplewas150females.Thestudyconcludedthattherewasnostatisticalsignificancedifferencebetweenthethreestudiedgroupsregardingpainscoresbeforeinterventionbuttherewasahighlystatistical significance difference between them after intervention (after use in thesame menstrual cycle, second cycleand after thirdcycle (p=<0.001)

Renee Quarrie., et.al., (2014), conducted aRandomized Clinical Trial onClinicalImpactofWarmedIntravenousSalineinSickle CellPatientsWithVaso-Occlusive Episodes to determine if warming the intravenous (IV) fluid given to patientswithSickleCellDiseasewhoareexperiencingpainfulepisodesinNationwideChildren's Hospitalwith80participants.A fluid warmer (the AstofloPlus warmer) wasused to warm fluid to body temperature 37.5 degrees Celsius. The study concluded thewarm saline was effective(p=<0.005).

Parminder Kaur, et. al., (2007), conducted a Study on intensity of knee jointpain by 'Application of Moist Heat' among geriatric population (≥ 60 years of age)selectedbysimplerandomsampling,residingatDaduMajraColony,U.T.,Chandigarh. 43 in the experimental and 44

in the control group. 'Moist heat' wasapplied at the knee joint twice a day for seven days in the experimental group. Theresults show that intensity of knee joint pain and intake of painkiller was reducedsignificantly in the experimental group as compared to the control group as indicatedby chi-square test. Hence, the use of moist heat application is recommended for homebasemanagement of knee joint pain.

Sylvia Deva Roopa (2005), conducted an experimental study on effectivenessof castor oil with hot application on knee joint pain among women at Kuthambakkamvillage area. One group pretest post-test design was used in this study. Totally 50women, in the age of 30 to 60 years who met the inclusion criteria, were selected byrandom sampling method.In the pre test, 28%of the women hadsevere knee jointpainand72%ofthewomenhadmoderatekneejointpainandintheposttestaftertwo weeks of intervention of castor oil massage with hot water application 24% of thewomen had moderate knee joint pain and 76% ofthe women had mild knee joint pain.

Literature related to the incidence of Heel prick among Newborn inNICU

Carl britto, et. al., (2017), conducted a Randomized Controlled Study onAssessment of Neonatal Pain during Heel Prick- Lancet vs Needle in a Level IIINICU,among40subjects(20ineachgroup).Hemodynamicallystablenewbornsonatleastthoseonpartialoralfeedsunder goingheelprickforroutineglucosemonitoring were randomized into two groups within 48 h of NICU admission, heelprickwitha lancetor witha 26-gauge needleusing computer-generated randomnumbers. Pain before, during and after (1 and 5 min) was assessed using the PIPPscore. Statistical analysis was done using the Mann Whitney U test and Friedman'stest. The findings revealed that there was a significantly lower duration of audible crywith use of lancet (10.5 ± 18.5 s vs. 75.2 ± 12.0 with needle; $p = 0.03$). Thestudy concluded that Heel prick with a lancet causes less crying than a 26-gaugeneedle.

KalaivaniKaliappanandVetriselvi,P(2017),conductedaprospectiveclinical trail study on effect of nesting on pain during heel prick procedure amongnewborninpostnatalcare unitof WCH,JIPMER,Puducherry.73sampleswereparticipated and assessed by the Neonatal Infant Pain Scale and data was analyzed bydescriptive and inferential statistics. The study resulted that during heel prick withoutnesting 39 (53.4%) had severe pain and 3 (4.1%) had mild to moderate pain and 31(42.5%). The study revealed that neonate undergone heel prick feel pain and thenesting reduce thepain level Though the percentage of neonates without nesting whohad severe pain 39 (53.4%) had been decreased to 32(43.8%) with nesting, thestatistical significance was p>0.05

GokuluG.,et.al.,(2016),conductedacomparativestudyonheelstickamong 60 newborn infants undergone heel prickfor screening in Marmara hospital,Turkey .The result showed that after heel prick the crying time (p=0.021) and NIPS(0.013) Scores were significantly higher in the study group and babies who receivedmore painful stimuli during the first few days of life showed greater pain responsesduringa subsequent heel prick.

Uman LS, Murthy CM (2009), conducted an observational study collectedround – the- clock bedside data on all painful or stressful procedures performed in 430NeonatesIntensiveCareUnits.Datawerecollectedfromthefirst14daysofadmission, during a 6-week period. The investigators identified 44 painful procedures,of which the 6 most common were nasal aspiration i.e. 28.9% of the procedures,tracheal aspiration 23.3%, heel stick 19.8%, adhesive removal 12.7%, gastric tubeinsertion 2.4%, and venipuncture 1.8%.

Neil McIntosh (2003), conducted a study on the pain of heel prick and itsmeasurement in preterm infants. There was a significant increase in variability of theheart rate ($p < 0.01$) when the stab of the heel prick occurred in addition to the otherelementsoftheprocedure(positioning,warming,alcoholswabcleansingandsqueezing). This dummy procedure itself caused some increase in variability althoughthis was not significant at the 5% level. There were similar significant increases invariability oftherespiratory rateandO_2 andCO_2 tensionsintheblood($P < 0.05$)duringthe stab procedure.

Bellieni C.V., Buonocore G. (2001), conducted a prospective randomized trialon a study on Sensorial Saturation: An Effective Analgesic Tool for Heel-Prick inPreterm Infant 85 heel prick (5 per babies) was performed routine blood samples. Thestudy revealed that sucking plus oral glucose have the greater analgesic effect withrespect to no intervention ($p < 0.001$). The effectofSS is statistically better than thatof glucose plus sucking ($p < 0.01$). SS promotes interaction between nurse and infantand is a simple effective form of analgesia for theNICU.

Literature related to warm application on pain response during heelprick

Varshini et. al., (2019), conducted a randomized clinicaltrial on Effects ofyakson therapeutic touch and heel warming on pain caused by heel stick procedure,vital signs, and cry duration in full-term neonates at healthcare centers in Mashhad,Iran, 2017. 78 full-term newborns referred to they were assigned into three groups ofYakson theraputic touch, heel warming using a hot-water bottle with the temperatureof 40°C, and control receiving routine care, through randomized block method. Then,vitalsignsbeforeandafterandpainintensityafterheel-stickprocedureweremeasured using Neonatal Infant Pain Scale (NIPS). This study concluded that theinterventions was effective. (p=0.03)

Bartell JC., (2016), conducted a study on warm water effect on pain ratingsafter heel prick, 80 participants received heelprick after warmapplicationin adouble-blind fashion assigned at random. Participants rated their pain after each heelprick pain analysed using a standard visual pain scale. Pain scores after heel prickwerequite low(34.2+/-2.5 mm).

Shu SH, et. al., (2014), conducted a randomized controlled trial on efficacy ofswaddling and heel warming on pain responses to heel stick in neonatesin criticalcare nursing clinic, North America. 25 neonates were randomly assigned and duringheel prick pain were assessed by neonatal infant pain scale.This study concluded thatboth swaddling and heel warming decreased the pain response of neonates during heelprick.

D.P Barker, et. al., (1996), conducted randomized study on capillary bloodsamplinginpostnatalwardsofNottinghamcityhospitaloveronemonthwith57 samples and warming using a gel pack prior to heel prick in 40^0C. The studyanalysedbyMannwhitneytest.Thestudyconcludedthatthewarmingheeliseffectivein increasingthe blood flow duringheelprick.

ConceptualFramework
Conceptualframeworkisanorganizedphenomenonwhichdealswithconcepts that areassembled byvirtueof theirrelevance to acommon theme.

Theconceptualframeworkofthisstudyisbasedon Sr.CallistaRoyadaptation model (1963). Roy considers the recipient of care to be an open, adaptivesystemandalsoreacttoandinteractwithothersysteminenvironment.Dysfunctionin one component affectsthe entiresystem.Itconsists of
1. Input
2. Throughput
3. Output

Input:
In Roy's system, input as stimuli which can come from the environment orfrom within a person. Stimuli are classified as focal (immediately confronting theperson) contextual (all other stimuli that are present) or residual (non specific such ascultural belief or attitude about illness). It also include person's adaptation level (therange of stimuli to which a person can adapt easily). Each person's adaptation level isunique and constantlychanging.

In this study input refers to, stimuliis (focal) the researcher applyingwarmsaline water (40^oC) soakedsterile gauze pad for2minute to the preferredleg forheel prick amongnewbornbeforecollecting samples for investigation purposeininterventiongroupand routine careincontrolgroup.

Throughput
Throughput makes use of a person's adaptive system or effectors (PhysiologicMode, Self Concept Mode, Role Function Mode,Interdependence Mode)

In this study throughput refers to warming the heel of newborn before heel prickprocedurewillincreasecoreandskintemperatureanditsleadtoincreasesinsympathetic active vasodilator nerveactivityto increase blood supply.

The effect of heat on pain is mediated by sensitive calcium channels (sensitiveto noxious heat). These respond to heat and generates action potential that increasestimulation of sensory nerves and cause feeling of heat in brain. Their multiplebinding sites allow number of factors (P2 X2 and P2 Y2) to activate. Once activatedtheyalso inhibit the activityof pain receptors

Copingmechanism
Coping mechanism is the process or behaviour pattern that a person uses forself-control can be inherited or learned such as regulator and cognator. These are thesubsystem of thepersonsadaptive system.

Regulator
This regulator subsystem consists of input stimuli, can come from the externalenvironmentorfromwithintheperson.Theinternalprocessincludingchemical,neural,endocrinetransmit.Thestimulicausingoutinthewayofphysiologicalresponses.

In this study input stimuli given by the researcher in the way of giving warmsaline application, it will cause chemical and neural stimulito sensitive calciumchannels(sensitive tonoxiousheat),these respondstoheatandgeneratesactionpotential that increase stimulation of sensory nerves and cause feeling of heat inbrain. Their multiple binding sites allow number of factors (P2X2and P2Y2) toactivate. Once activated they also inhibit the activity of pain receptors will causeoutput responses in the wayof changes in the painlevel.

Cognator
Thecognatorsubsystemregulatesself-concept,rolefunction,interdependence and control internal processes related to higher brain function, such asperception, information, processing, judgment and emotion .

Inthisstudycognatorsubsystemcontrolinternalprocessrelatedtohigherbrain function such as perception of the pain and express the emotions in the way ofminimal cryand nochanges in facialexpression, relaxed arms and legs.

Adaptivemode
Adaptive mode is the part of the internal processes and act as a system effectorand to adapt with the stimuli and express in the stimuli and express in the way ofbehaviour it include self – concept mode, interpendence mode,physiological mode,role function mode. It can be identified either adaptive or maladaptive responses byadaptivemode.

In this study physiological function in the adaptive mode is the changes in thepain level and in self-concept, newborn express the feelings in the way of cryingandfacial expression and their role function is parents allowed their children to participatein the study and in interdependence mode, parents ofnewborn havingsignificantrelationship with researcher.

Output
Output is outcome of the system–persons behavior. Output may be adaptiveresponse orineffective response.

In this study adaptive response refers to changes in pain level. Ineffectiveresponsesisintervention do not attainthe goal(no changesin the pain level) and itis measured byNeonatal Infant Pain Scale among Newborn in both InterventionandControl Group. Newborn who is receiving intervention have effective responsecompare with control group.

Research Methodology:-

CHAPTER – III

RESEARCHMETHODOLOGY

The methodology of research indicates the general pattern of developing orrefining the methodsof obtaining, organizing oranalyzing data forgatheringvalidand reliable data for investigation. This chapter includes research design, settingofthe study, population, sample, and inclusion and exclusion criteria for selection ofsample, development and description of the tool, content validity, pilot study, datacollection procedureandplan for dataanalysis.

Researchapproach

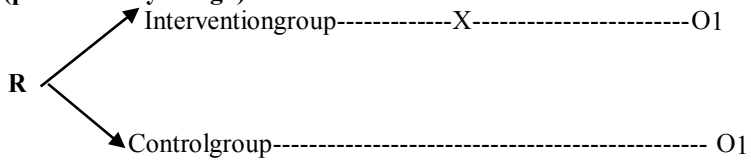
The research approach is the most essential part of any research. The entirestudy is based on it. A research approach tells the researcher about the collection ofdata that is what to collect, when to collect, how to collect and how to analyze. It alsohelps the researcher with suggestions of possible conclusions to be drawn from thedata.

According to Polit and Hungler (1999) evaluative research is an appliedformat research that involves finding out how well a program, practice, procedure orpolicy is working. It involves the collection and analysis of information relating to thefunctioningofa programor procedure.

In this study, the investigator used **quantitative evaluative approach** whichwas aimed to evaluate the effectiveness of warm saline water application on painresponse duringheel prick.

Researchdesign

According to Kothari.C.R. (2003) "A research design is defined as the overallplan for collecting and analyzing data, including a specification for enhancing theinternal and external validity of the study "The research design is the plan, structureand strategy of investigations of answering the research question. It is the overall planor blueprint the researcher select to carry out the study. The research design used inthis studywas **True – experimental (post test only design).**



R -Randomization

O1-Post testlevel of pain duringheel prickamongNewborn

Variables

The variable is "an attribute of a person or object that varies that is takendifferent values" - **Polit and Hunger**

Independentvariable: Warmsalinewaterapplication

Dependentvariable:Painresponseduringheelprick

Base line variables: Age of the baby , gender , weight of the baby, mode ofdelivery,gestationalweek,APGARscoreat5min,modeoffeeding,lengthofhospitalization, babyadmitted level, time oflast feed, position of the baby.

SettingoftheStudy

The setting is the physical location and condition in which datacollectiontakes placein thestudy. - **Politand Hunger**

Thesettingforthestudywasselectedbasedonacquaintanceoftheinvestigator with the institution, feasibility of conducting the study, availability of thesample, permission and proximity of the setting for investigation. Thestudy wasconducted in Neonatal intensive care unit at Government Rajaji Hospital, Madurai. Itis the second largest Govt. medical college hospital in Tamil Nadu. It has all specialtydepartments. At present there are 3102 beds available in Government Rajaji Hospital,MaduraiandNICUhave3levels,accordingtoconditionofnewborn,theyareadmitting in Level I, Level II, Level III. Approximately in an average 540 newbornadmitted per month forcareand treatment in Government Rajaji Hospital, Madurai.

Population

Thepopulationisdefinedastheentireaggregationofcasesthatmeetadesignedcriterion.

Targetpopulation
Target population ofthisstudywas Newborn undergoingheel prick.

Accessiblepopulation
The accessible population of thisstudy comprised of Newborn undergoingheel prick at NICU, GovtRajaji Hospital, Madurai.

Sample
ThesampleconsistofNewbornundergoingheelprickatNICU,GovernmentRajaji Hospital, Maduraiwho met the inclusion criteria.

Samplesize
Thesample sizeconsists of 60 samples,
1. 30subjectswasassigned to Interventiongroup
2. 30subjects wasassigned tocontrolgroup.

Samplingtechnique
Subjectswasselectedthroughprobability(simplerandom–Lotterymethod)samplingtechnique.

Criteria for sampleselection
Thefollowing arethe criteriaforthe selection of samples forthe study.

Inclusioncriteria
Thestudyincludes
1. Newbornwhowasreceivingheelprickforbloodsampling
2. Newbornwho wasweighedfrom2.5kg
3. NewbornadmittedinlevelIandlevelII

Exclusioncriteria
Thestudyexcludes
1. Criticallyill newbornbabies
2. ThenewbornwhoseParentwerenotwillingtoparticipatetheirbabiesinthisstudy.

Researchtool andtechnique
Thetool forthestudyis consistsof twosections.
SectionA:Baselinevariables
SectionB:Neonatalinfantpainscale

SectionA:
Base line variables:
Age of the baby , gender , weight of the baby, mode ofdelivery,gestationalweek,APGARscoreat5min,modeoffeeding,lengthofhospitalization, babyadmitted level, time of last feed, position of the baby.

SectionB:
NeonatalInfantPainScale

Section BNeonatalInfantPainScale

Painassessment				
Parameters	**ClinicalFindings**	**Score**	**Newbornfinding (tick□)**	**Score Awarded**
Facialexpression	Relaxedmuscle	0		
	Grimace	1		
Cry	NoCry	0		
	Whimper	1		
	Vigorous cry	2		

Breathingpattern	Relaxed	0		
	Changeinbreathing	1		
arms	Relaxed/restrained	0		
	Flexed/extended	1		
legs	Relaxed/restrained	0		
	Flexed/extended	1		
Stateofarousal	Sleeping/awake	0		
	Fussy	1		
Total				

Where, Cry
1. **Nocry-** Quite,Nocrying
2. **Whimper**-MildMoaning, Intermittent
3. **Vigorouscry**- LoudScream,RisingShrillContinuous

Breathing
1. **Changeinbreathing-**Indrawing,Irregular,Fasterthanusual,Gagging,Breathholding

ArmsandLegs
1. **Relaxed/restrained:**Nomuscularrigidity,Occasionalrandommovementsoflimb.
2. **Flexed/extended:**Tensestraightrigidand/orRapidextensionflexion.

Stateof Arousal
1. **Sleeping/awake:**Quitepeacefulsleepingor alert andsettled.
2. **Fussy:**Alert,Restlessandthrashing.

Scoreinterpretation:

Score	Interpretation
0 – 2	Nopain-Mildpain
3 – 4	Moderatepain
5 – 7	Severepain

Testingofthetool

Validityofthe tool

"Validity is the degree to which an instrument measures what is intended toMeasure"
(PolitandHungler.1995)

The tool was validated by five experts, two professors from Department ofPediatric medicine and three experts from Department of pediatric Nursing. Expertsvalidate the clarity, relevance, comprehensiveness and appropriateness of the content.Based on their suggestions reframingof thetoolwas made.

Reliabilityofthe tool

The reliability of a measuring instrument is a major criterion for assessing itsquality and adequacy. Reliability is the consistency with which it measures the targetattribute. The reliability of the tool was done by split half method r = 0.87. Hence thetool was consider asreliable andit was used for main study.

Pilot study

A Pilot study wasconducted in NICU,Government RajajiHospital, Maduraito test the feasibility, relevanceand practicability of the tool. Aformalpermissionwas obtain from Institutional Review Board / Ethical Committee and the head of thedepartment of NICU, Government Rajaji Hospital, Madurai for pilot study. Study wasconducted from 20.02.2019 to 24.02.2019. Through the probability sampling (SimpleRandom – Lottery Method) technique the samples was selected. 10 Newborn wasassigned into two groups, 5 subjects for Intervention group and 5 subjects for Controlgroup.Thepurposeofthestudywasexplaintothecaregiversbeforestartingthedatacollection. Informed oral and written consent from the caregivers. Confidentiality wasmaintained throughout the study. Intervention was given to the intervention groupalong with routine care, only routine care was given to control

group. Post test wasconducted among the newborn after heel prick by Neonatal Infant Pain scale. Thefindings of the pilot studyrevealed that the tool was feasibleand practicable.

Data collectionprocedure

AfterobtainingtheformalpermissionfromInstitutionalReviewBoard/Ethical Committee andthe headof the department of NICU, Government RajajiHospital, Madurai.Thesamples wasselected based on the Probability (simplerandom–lotterymethod)samplingtechnique.Theinvestigatorintroducedherselftothenewborn'scaregivers.Informedoralandwrittenconsentwasobtainedfromthecaregivers.Appliedwarmsalinewater(40^{o}C)soakedsterilegauzepadfortwominutes to the preferred leg for heel prick and wipe with Sterile dry Gauze pad amongnewborn belonging to Intervention group. Achilles tendon and ankle is fixed withthumb and fingers. After aseptic technique, Heel prick samples were drawn by usingsterile lancet. Post test was conducted among newborn after heel prick by NeonatalInfant Pain scale.

Plan for data analysis

Thedatawasanalyzedaccordingtoobjectivesofthestudybyusingdescriptiveand inferential statistics.

Descriptivestatistics

Frequencyand percentagewas usedforanalyzing the baselinevariables.

Inferentialstatistics

Unpaired t-test was used to determine the effectiveness of warm saline waterapplication on pain response duringheel prickamongNewborn.

Chi –Square test was used to find out the association between the level of painresponse during heel prick among Newborn admitted at NICU, Government RajajiHospital and their selected base line variables.

EthicalConsiderations

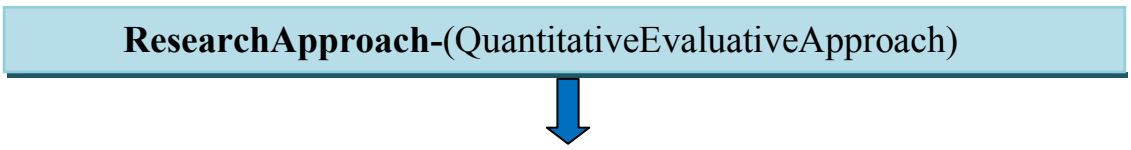
TheresearchproposalwasapprovedbytheexpertsoftheDissertationCommittee of College of Nursing, Madurai Medical College, Madurai and the samewasapprovedbyInstitutionalReviewBoard/IndependentEthicalCommitteeofMadurai medical Collegeforconductingthe pilotstudyand main study.

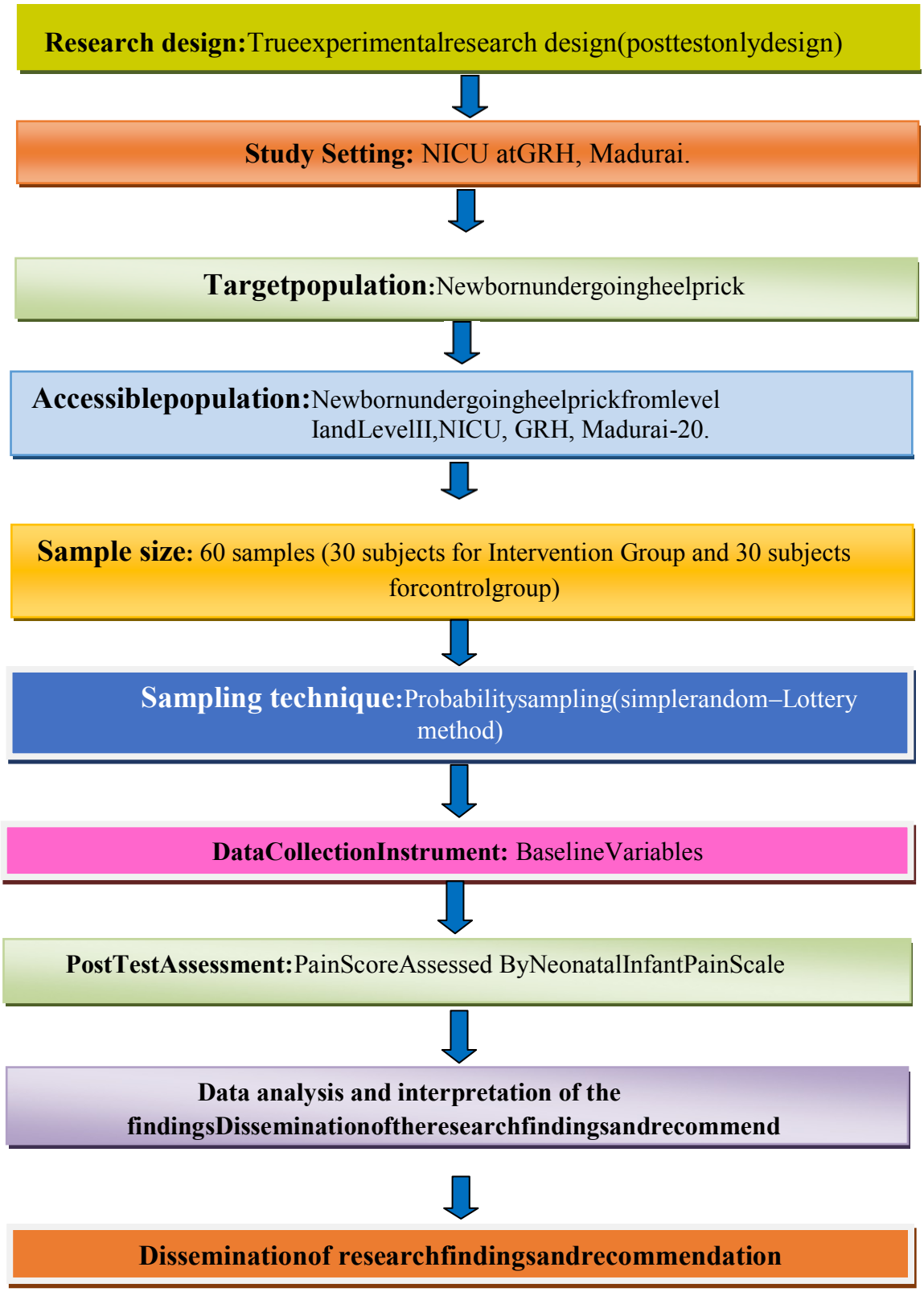
Protectionof humanrights

The research proposal was approved by the Ethical committee, Head of thedepartmentofNICU,DissertationCommitteeofCollegeofNursing,MaduraiMedical College, Madurai to conduct the main study.

1. Informed verbal and written consent was obtained from all the care givers ofNewbornbabies andthedatacollectionwas keptconfidential.
2. Their babies was withdraw from the studyat anytimewithout anypenalty.
3. Confidentialitywas maintained throughout thestudy
4. Positivebenefits wasexplainedtoall caregivers.

SchematicRepresentationofMethodology




Research design:Trueexperimentalresearch design(posttestonlydesign)
Study Setting: NICU atGRH, Madurai.
Targetpopulation:Newbornundergoingheelprick
Accessiblepopulation:Newbornundergoingheelprickfromlevel IandLevelII,NICU, GRH, Madurai-20.
Sample size: 60 samples (30 subjects for Intervention Group and 30 subjects forcontrolgroup)
Sampling technique:Probabilitysampling(simplerandom–Lottery method)
DataCollectionInstrument: BaselineVariables
PostTestAssessment:PainScoreAssessed ByNeonatalInfantPainScale
Data analysis and interpretation of the findingsDisseminationoftheresearchfindingsandrecommend
Disseminationof researchfindingsandrecommendation

Data Analysis And Interpretation
CHAPTER– IV
DataAnalysisAndInterpretation

Analysis and interpretation is an important step in research process whichinvolves the computation of the certain measures along with searching for patterns ofrelationship that exists among the data groups. Data collection is followed by theanalysis and interpretation of data, where collected data are analysed andinterpretedin accordancewith studyobjectives.

Thischapterdealswiththeanalysisandinterpretationofdatacollectedfrom60samplesofpatientstoevaluatetheachievementoftheobjectivesofthestudyandit deals with the statistical analysis. Statistical procedure enables the researcher toorganize,analyse,evaluate,interpretandcommunicatenumericalinformationmeaningly.

PresentationofData
Thecollecteddatawereorganized,tabulated,analysedandpresentedinfollowingheadings.

SectionI:
Frequencyandpercentagedistributionofnewbornundergoneheelprickaccordingto their selected baseline variables ofintervention and controlgroup.

Section II:
Evaluatetheeffectivenessofwarmsalinewaterapplicationduringheelprickamongnewborn in intervention group.

Section III
Associationbetweenthelevelofpainresponseduringheelprickamongnewborn with their selected base line variables of Intervention group and Controlgroup.

SectionI
Description of newborn undergone heel prick according to their selectedbaselinevariables

Table1:-
Frequencyandpercentagedistributionofnewbornundergoneheelprickaccordingtotheirbaselinevariables
n=60

Baselinevariables		Group				χ2
		Intervention (n=30)		Control (n=30)		
		f	%	f	%	
Ageofthe baby	1-7days	21	70.00%	20	66.67%	χ2=0.09p=0.95(NS)
	8-14days	7	23.33%	8	26.66%	
	15-22days	2	6.67%	2	6.67%	
	23-28days	0	0.00%	0	0.00%	
Genderof TheBaby	Male	14	46.67%	15	50.00%	χ2=0.07 p=0.79(NS)
	Female	16	53.33%	15	50.00%	
Weightof TheBaby	2.5-3 kg	13	43.33%	11	36.67%	χ2=0.34p=0.95(NS)
	3.0-3.5 kg	10	33.34%	12	40.00%	
	3.5 –4.0 kg	4	13.33%	4	13.33%	
	>4.0kg	3	10.00%	3	10.00%	
ModeofDelivery	Normalvaginal delivery	14	46.67%	13	43.33%	χ2=0.07p=0.96(NS)
	Caesareansection	15	50.00%	16	53.34%	
	Instrumental delivery	1	3.33%	1	3.33%	
	Ventousdelivery	0	0.00%	0	0.00%	

GestationalWeekDuringBirth	35-36weeks	3	10.00%	1	3.33%	χ^2=1.16p=0.76(NS)
	37-38weeks	9	30.00%	9	30.00%	
	39-40weeks	11	36.67%	13	43.34%	
	>40weeks	7	23.33%	7	23.33%	
APGAR Score at5min	<3	0	0.00%	0	0.00%	χ^2=0.16p=0.92(NS)
	4-6	4	13.34%	4	13.33%	
	7-10	22	73.33%	23	76.67%	
	Notavailable	4	13.33%	3	10.00%	
BabyAdmittedIn	Level I	20	66.67%	23	76.67%	χ^2=0.73 p=0.39(NS)
	Level II	10	33.33%	7	23.33%	
Modeof Feeding	Directbreastfeeding	22	73.33%	23	76.67%	χ^2=0.22p=0.90(NS)
	Direct breast feedingandexpressed breastmilk	5	16.67%	5	16.66%	
	Expressedbreast milk	3	10.00%	2	6.67%	
	Expressedbreast milkand IVfluid	0	0.00%	0	0.00%	
TimeofLastFeed	Lessthan15mins	4	13.33%	7	23.33%	χ^2=2.00p=0.57(NS)
	15mins – 30 mins	8	26.67%	10	33.34%	
	30mins-1 hrbefore	11	36.67%	7	23.33%	
	Morethan1 hour	7	23.33%	6	20.00%	
Length ofHospitalization	1-3days	16	53.33%	19	63.33%	χ^2=0.65p=0.72(NS)
	4-6days	11	36.67%	9	30.00%	
	7-10days	3	10.00%	2	6.67%	
	>10days	0	0.00%	0	0.00%	
PositionofNewborn DuringHeelprick	Lyingposition	24	80.00%	22	73.33%	χ^2=0.37 p=0.54(NS)
	Motherslap	6	20.00%	8	26.67%	

The above table 1 depicts the frequency and percentage distribution ofnewbornundergoneheelprickaccordingtotheirbaselinevariablesbothinintervention and control group.

Withrespecttoage,ininterventiongroup,majorityofthesubjects,21 (70.00%) werein between 1-7 days, 7 (23.33%)were inbetween 8 -14 daysand 2 (6.67%) werein between 15-22 days,none of themin the age groupbetween23-28 days, where as in control group majority of the subjects, 20 (66.7%) were inbetween 1-7 days. 8 (26.66%) were in between 8-14 days and 2 (6.67%) were inbetween 15-22 days,noneof them in theagegroup between23-28 days.

Whendealingwithgender,ininterventiongroup,majorityofthesubjects,16 (53.33 %) were females and 14 (46.67 %) were males, whereas in Control group,majorityof subjects15 (50%) weremalesand 15(50 %) were females.

While discussing theweight of the baby,in intervention group,majority ofsubjects,13(43.33%)werehadbetween2.5-3kg,10(33.34%)werehadbetween3-3.5 kg, 4 (13.33%) werehad between3.5 - 4 kg and 3 (10.00%)were had morethan 4 kg, whereas in Control group majority of subjects, 12 (40.00%) were hadbetween3-3.5kg,11(36.67%)werehadbetween2.5-3kg,4(13.33%)werehadbetween 3.5-4kgand 3 (10.00%)were had morethan 4 kg.

While considering the mode of delivery, in intervention group, majority ofthe subjects, 15 (50.00%) were delivered by caesarean section, 14 (46.67%) weredeliveredbynormalvaginaldelivery,1(3.33%)wasdeliveredbyinstrumentaldelivery,noneofthemdeliveredbyventousdelivery,whereasincontrolgroupmajorityofthesubjects16(53.34%)weredeliveredbycaesareansection, 13 (43.33%) were delivered by normal vaginal delivery and 1 (3.33%) wasdeliveredbyinstrumental delivery,none of them deliveredbyventousdelivery.

With regards to the gestational week during birth, in intervention groupmajority of the subjects 11 (36.67%) were delivered at 39-40 weeks, 9 (30.00%) weredeliveredat37-38weeks,7(23.33%)weredeliveredatmorethan40weeksand3 (10.00%) were delivered at 35-36 weeks, whereas in control group majority ofsubjects13(43.34%)weredeliveredat39-40weeks,9(30.00%)weredeliveredat37-38weeks,7(23.33%)weredeliveredatmorethan40weeksand1(3.33%)wasdelivered at 35- 36 weeks.

As far as concern to theAPGAR Score at 5 min, in interventiongroup,majority of the subjects, 22 (73.33%) were had between 7-10 scores, 4 (13.34%) werehad 4-6 score and 4 (13.33%)scoreswere not available,none of them hadless than3, whereas in control group majority of the subjects 23 (76.67%) were had between7-10 scores, 4 (13.33%) were had 4-6 score and 3 (10.00%) scores were not available,noneof themhad less than 3.

While discussingthe babyadmittedinthe level,ininterventiongroup,majority of the subjects, 20 (66.67%) were admitted in Level I and 10 (33.33%) wereadmittedinlevelII,whereasinthecontrolgroupmajorityofthesubjects23 (76.67%) admitted inLevelIand 7(23.33%) were admitted inlevelII.

When dealing with Mode of feeding,in intervention group, majority of thesubjects,22 (73.33%) were haddirect breast feeding, 5 (16.67%) were had directbreast feeding and expressed breast milk, 3 (10.00%) were had expressed breast milk,none of themhadexpressed breast milk and IV fluids, whereas in control groupmajorityofthesubjects23(76.67%)werehaddirectbreastfeeding,5(16.67%)werhad direct breast feeding and expressed breast milk, 2 (6.67%) were had expressedbreast milk,none of them hadexpressed breast milk andIVfluids.

While mentioning thetime of lastfeed,in intervention group,majority ofthe subjects, 11 (36.67%) werehad between 30 minute –1 hour, 8 (26.67%) were hadbetween15minutes-30minutes,7(23.3%)werehadmorethanonehourand4 (13.33%) were had less than 15 minutes, whereas in control group majority of thesubjects,10(33.34%)were hadbetween15minutes-30minutes, 7(23.33%) were

hadbetween30 minute – 1 hour, 7 (23.33%) were hadless than 15 mins and 6 (20.00%)werehad morethan onehour

While stating the length ofhospitalization, in intervention group, majorityof the subjects, 16 (53.33%) were had between 1-3 days, 11 (36.67%) were hadbetween 4-6daysand 3(10.00%) were had between 7-10 days,none of themhadmore than 10 days, whereas in control group majority of the subjects 19 (63.33%)were had between 1-3 days,9 (30.00%) were had between 4-6 days and 2 (6.67%)werehad between 7-10 days, none of them had morethan 10 days.

With respect to the position of child during heel prick, in interventiongroup, majority of the subjects, 24 (80.00%) were in lying position and 6 (20.00%)were in mother's lap, whereas in control group majority of the subjects, 22 (73.33%)werein lyingposition, 8 (26.67%) werein mothers lap.Distributionof subjects according toage of the baby

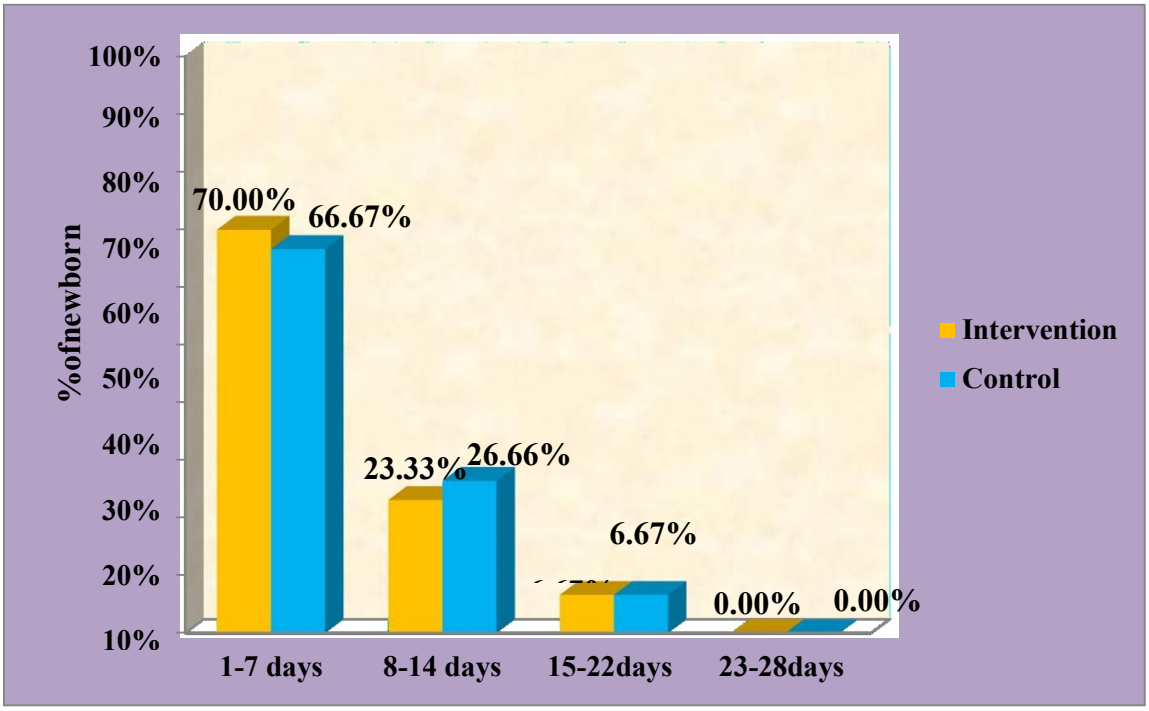
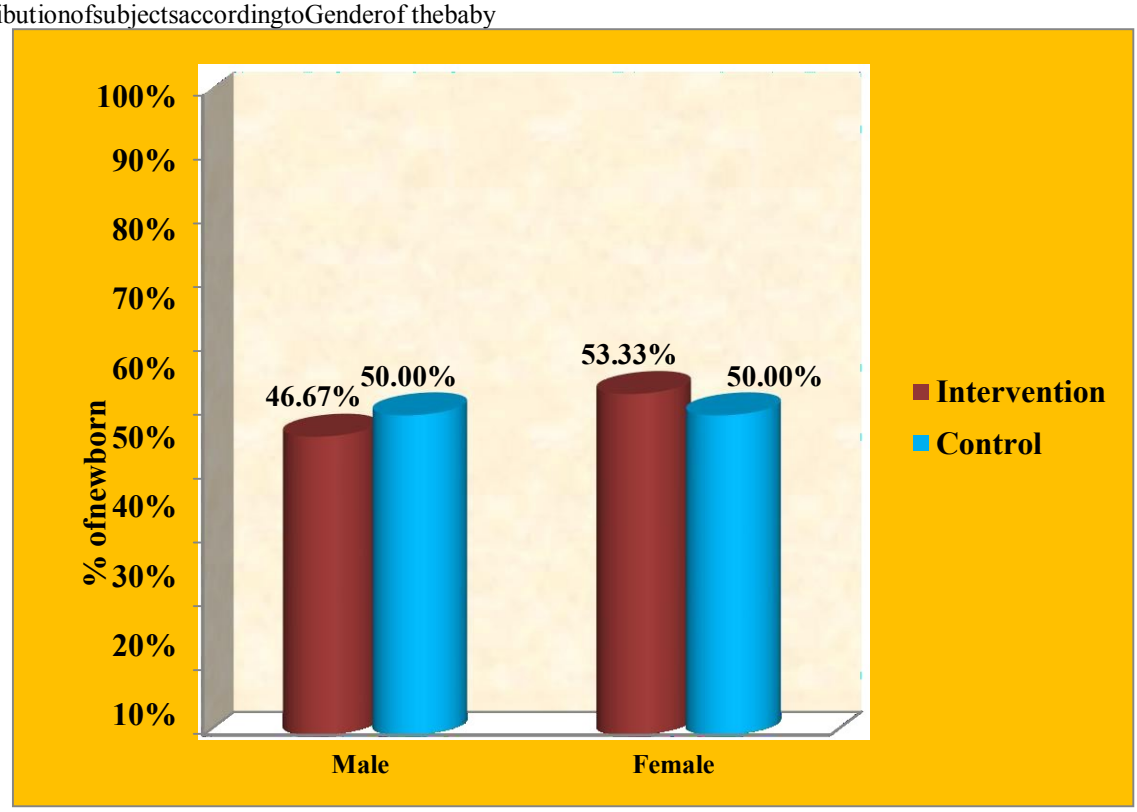


Figure 2: Multiple bar diagram quotes that percentage distribution of subjectsduringheel prickaccording to theirage

Theabovebardiagramshowsthatininterventiongroup,majority ofthesubjects21 (70.00%) werein between 1-7 days,7 (23.33%) were inbetween8 -14days and2 (6.67%) werein between 15-22 days,none of them in the age groupbetween23-28 days, whereas in control group majority of the subjects, 20 (66.7 %)wereinbetween 1-7 days. 8 (26.66%) were inbetween8 -14days and 2 (6.67%)werein between 15-22 days, noneof themin the agegroup between23-28 days

DistributionofsubjectsaccordingtoGenderof thebaby



Theaboveclusteredcylinderdiagramshowsthat,ininterventiongroup,majority of the subjects, 16 (53.33 %) were females and 14 (46.67 %) were males,whereas in control group, majority of subjects 15 (50%) were males and 15 (50 %)were females.

Distributionof subjectsaccordingtoweightofthebaby

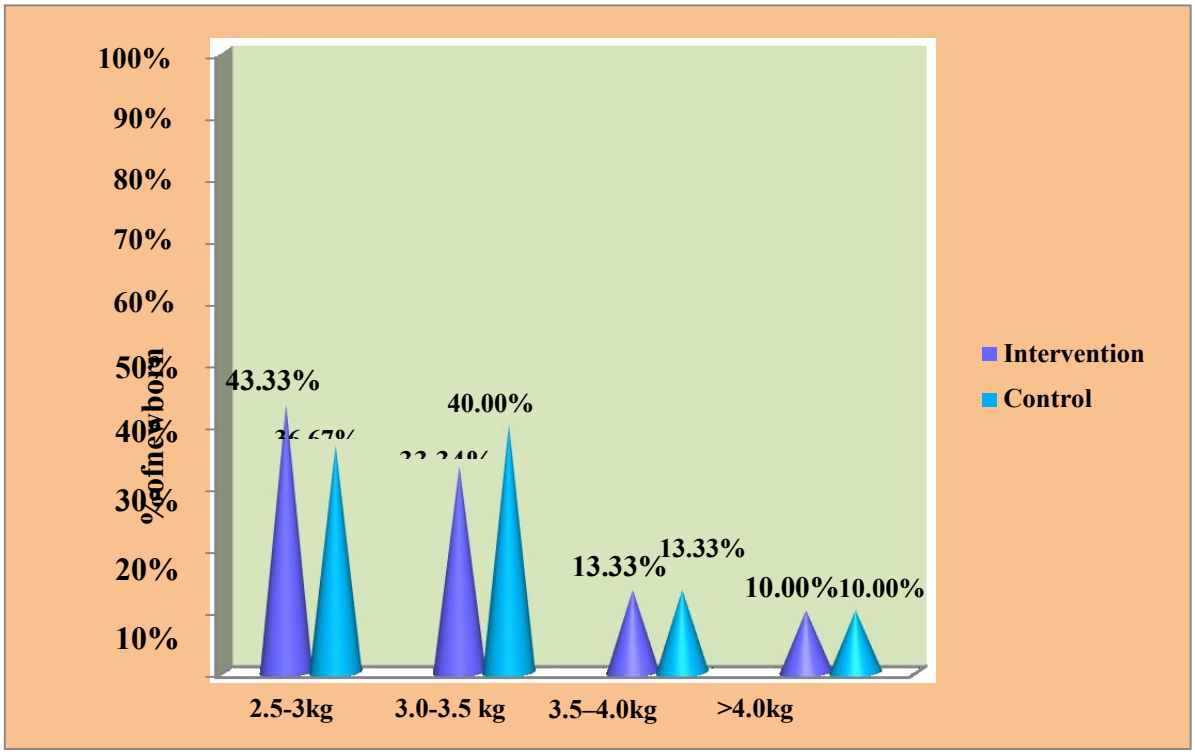


Figure 4:- Cone diagram depicts the percentage distribution of subjects duringheelprickaccording to their weight

TheaboveConediagramshowsthat,ininterventiongroup,majorityofsubjects,13(43.33%)werehadbetween2.5-3kg,10(33.34%)werehadbetween3-3.5 kg, 4 (13.33%) werehad between3.5-4 kg and 3 (10.00%) were had morethan 4 kg, whereas in control group majority of subjects, 12 (40.00%) were hadbetween3-3.5kg,11(36.67%)werehadbetween2.5-3kg,4(13.33%)werehadbetween3.5-4 kgand3(10.00%) werehad more than 4 kg.

Distributionofsubjectsaccordingtomodeofdelivery

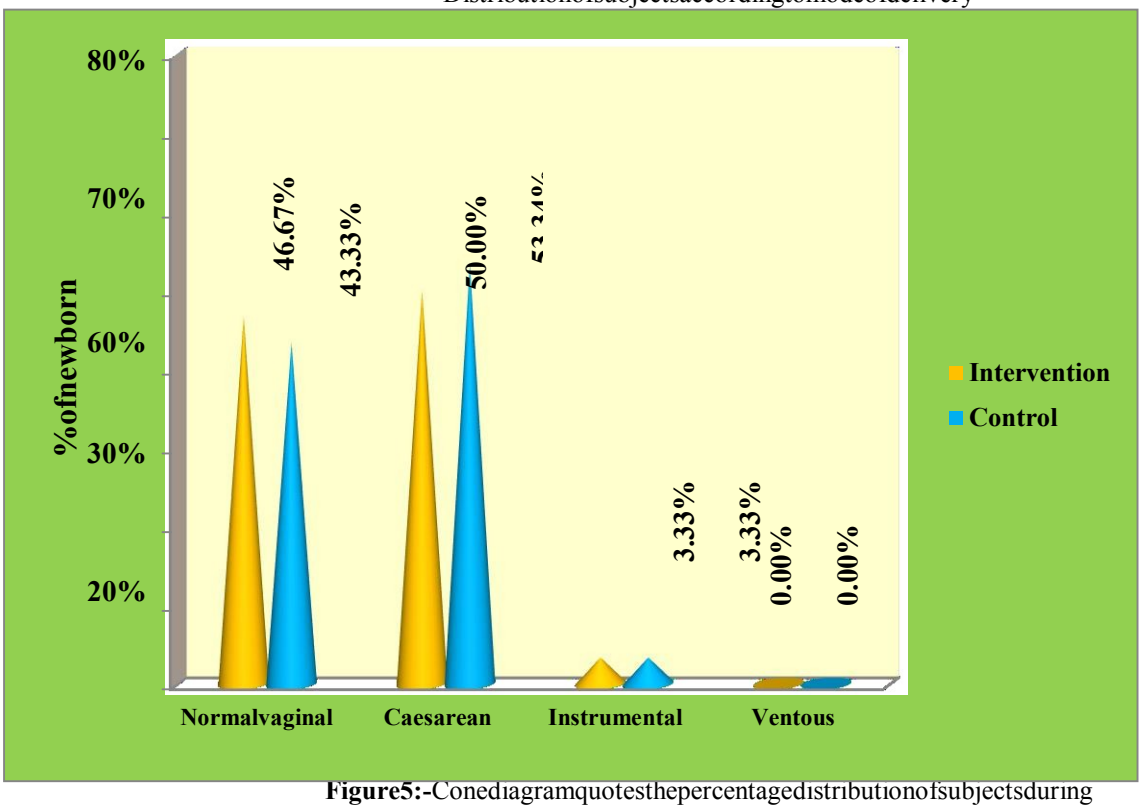
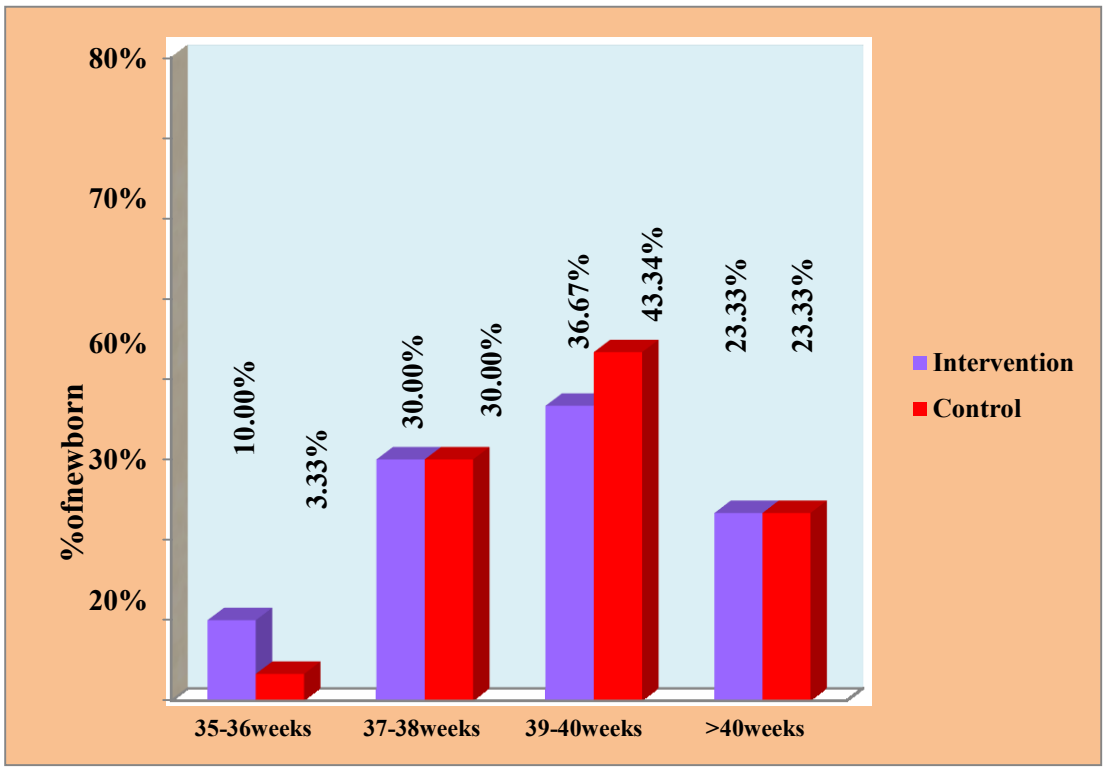


Figure5:-Conediagramquotesthepercentagedistributionofsubjectsduring heelprickaccordingto their modeofdelivery.

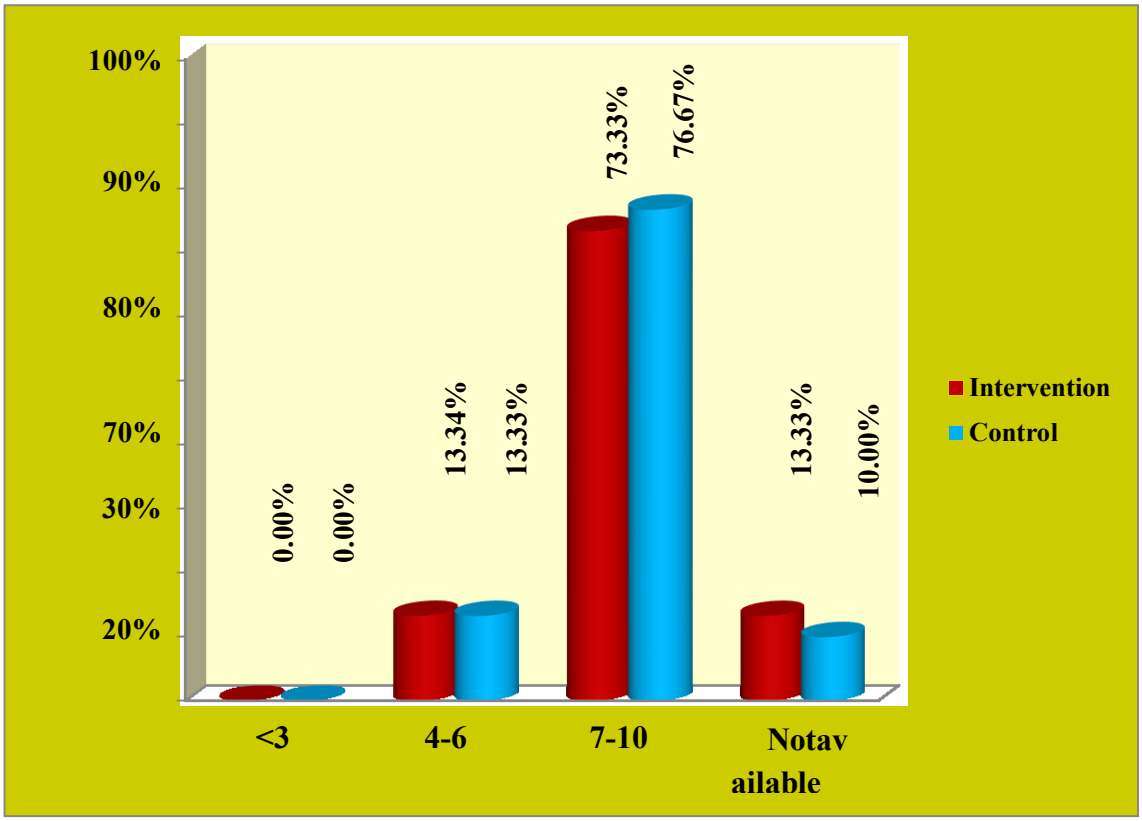
The above cone diagram shows that, in intervention group, majority of thesubjects,15(50.00%)weredeliveredbycaesareansection,14(46.67%)weredeliveredbynormalvaginaldelivery,1(3.33%)wasdeliveredbyinstrumentaldelivery, none of themdelivered by ventous delivery, whereasin control groupmajorityofthesubjects 16 (53.34%) were delivered by caesarean section,13 (43.33%) were delivered by normal vaginal delivery and 1 (3.33%) wasdeliveredbyinstrumental delivery,none of themdeliveredbyventous delivery.

Distributionofsubjectsaccordingtogestationalweekduringbirth



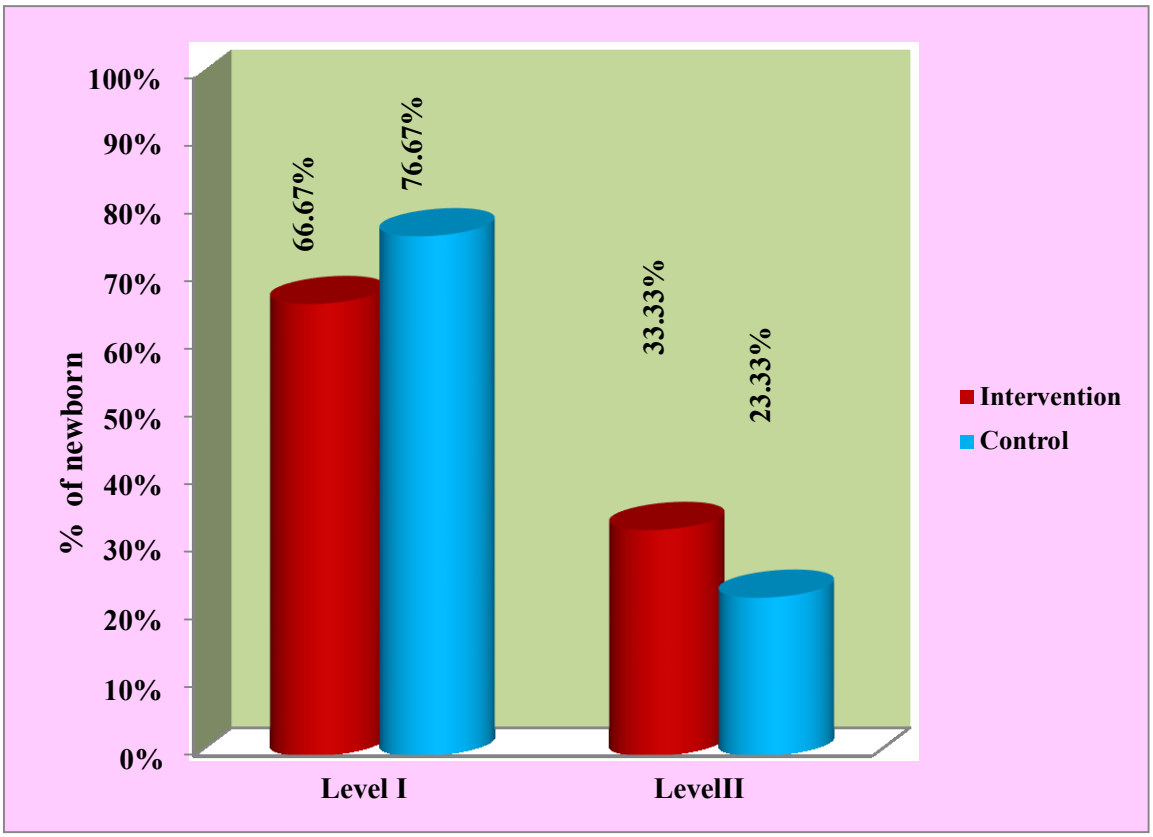
The above 3 D clustered column diagram shows that, in intervention groupmajorityofthesubjects11(36.67%)weredeliveredat39-40%,9(30.00%)weredelivered at 37-38 weeks, 7 (23.33%) were delivered at more than 40 weeks and 3(10.00%)weredeliveredat35-36weeks,whereasincontrolgroupmajorityofsubjects13(43.34%)weredeliveredat39-40weeks,9(30.00%)weredeliveredat37-38weeks,7(23.33%)weredeliveredatmorethan40weeksand1(3.33%)wasdelivered at35- 36 weeks.

DistributionofsubjectsaccordingtoAPGARscore at5 min



Theaboveclusteredcylinderdiagramshowsthat,ininterventiongroup,majority of the subjects 22 (73.33%) were had between 7-10 scores, 4 (13.34%) werehad 4-6 score and 4 (13.33%) scores were not available, none of them had less than 3,whereasincontrolgroupmajorityofthesubjects23(76.67%)werehadbetween7-10 scores, 4 (13.33%) were had 4-6 score and 3 (10.00%) scores were not available.noneof themhad less than 3.

Distributionofsubjectsaccordingtobabyadmittedlevel



Theaboveclusteredcylinderdiagramshowsthat,ininterventiongroupmajority of the subjects, 20 (66.67%) were admitted in Level I and 10 (33.33%) wereadmittedinlevelII,whereasinthecontrolgroupmajorityofthesubjects23 (76.67%) admitted inLevelIand7(23.33%)were admitted in levelII.

Distributionofsubjectsaccordingtomodeoffeeding

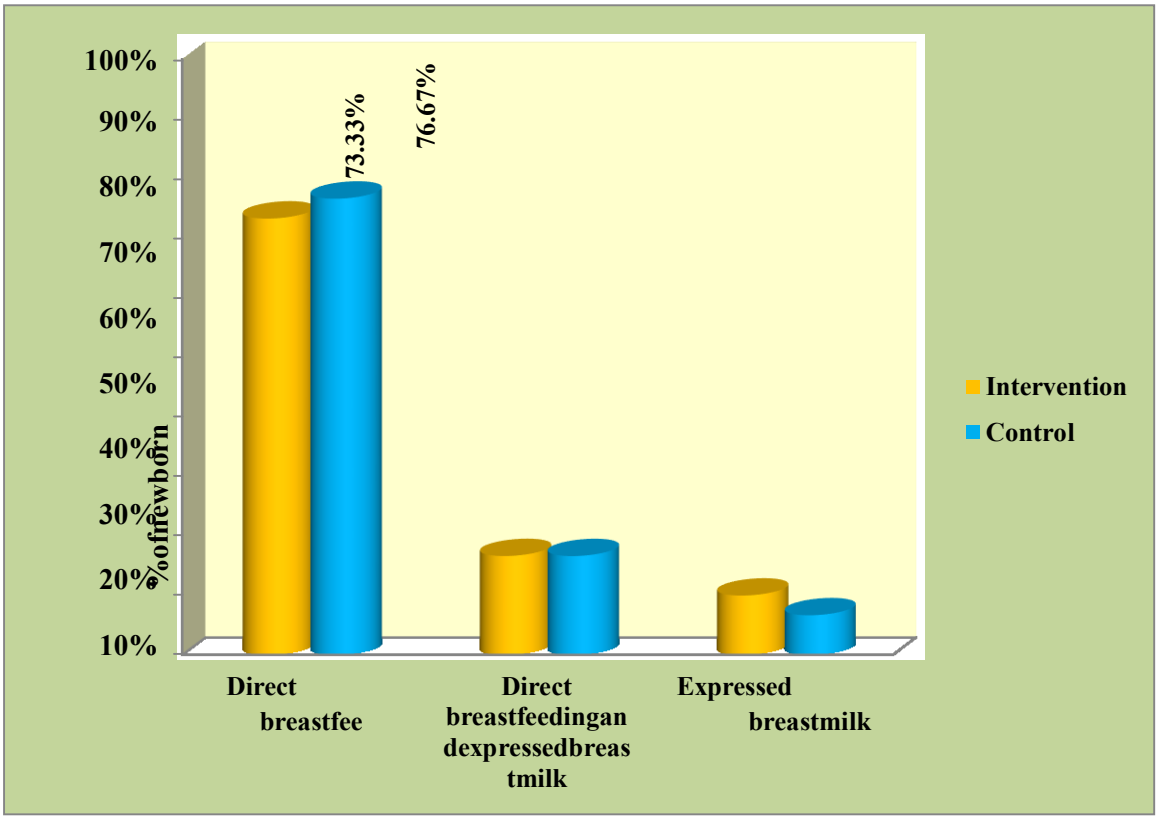


Figure 9:- Clustered cylinder diagram depicts the distribution of subjects duringheelprick accordingto theirmodeoffeeding

Theaboveclusteredcylinderdiagramshowsthat,ininterventiongroupmajority of the subjects 22 (73.33%) were had direct breast feeding, 5 (16.67%) werehad direct breast feeding and expressed breast milk, 3 (10.00%) were had expressedbreast milk, none of them had expressed breast milk and IV fluids, whereas in controlgroup majority of the subjects 23 (76.67%) were had direct breast feeding, 5 (16.67%)werehaddirectbreastfeedingandexpressedbreastmilk,2(6.67%)werehadexpressed breast milk,none of themhadexpressed breast milk andIVfluids.

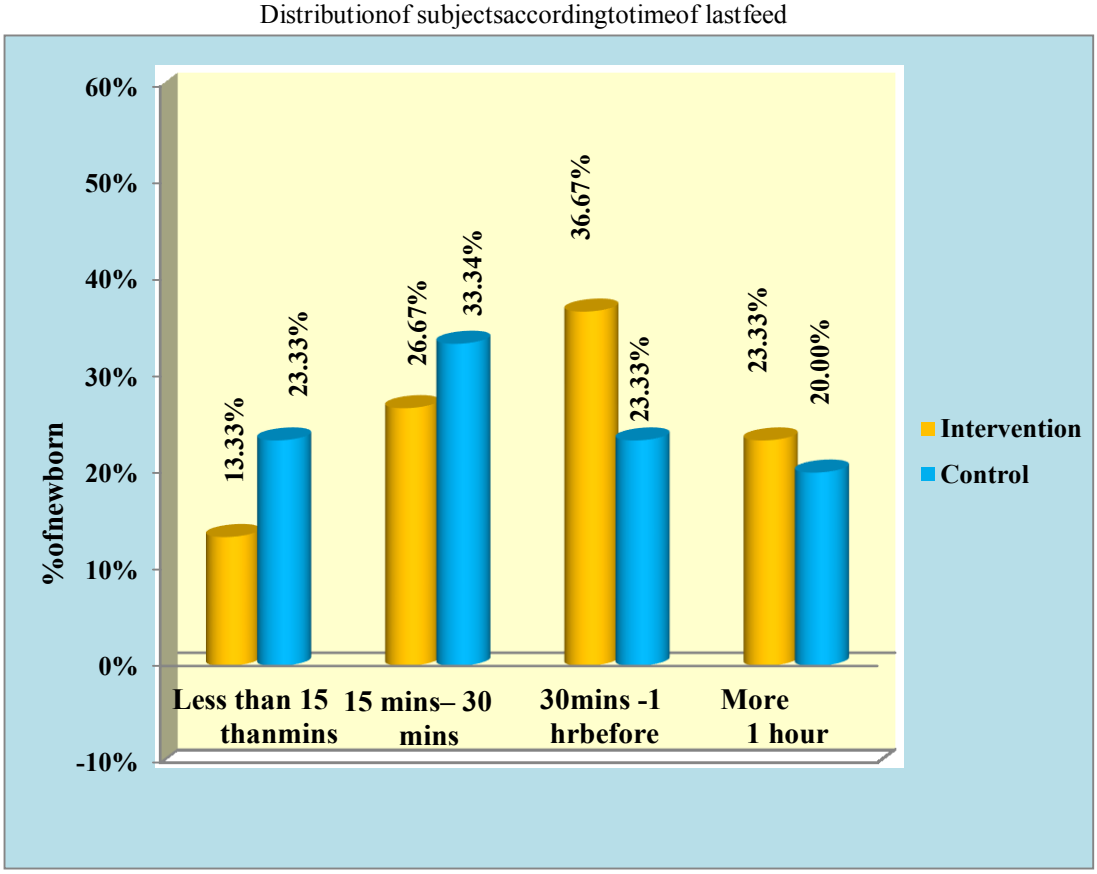


Figure 10:- Clustered cylinder diagram depicts the distribution of subjects duringheelprick according to theirtimeoflast feed.

Theaboveclusteredcylinderdiagramshowthat,ininterventiongroup,majorityofthesubjects,11(36.67%)werehad between30minute-1hour,8 (26.67%) were hadbetween15 minutes - 30 minutes, 7 (23.3%) were had morethan one hour and 4 (13.33%) were hadless than 15 minutes, whereas in controlgroupmajorityofthesubjects,10(33.34%)werehadbetween15minutes-30 minutes, 7 (23.33%) were hadbetween30 minute – 1 hour, 7 (23.33%) were hadless than 15 mins and 6 (20.00%) werehadmorethanone hour.

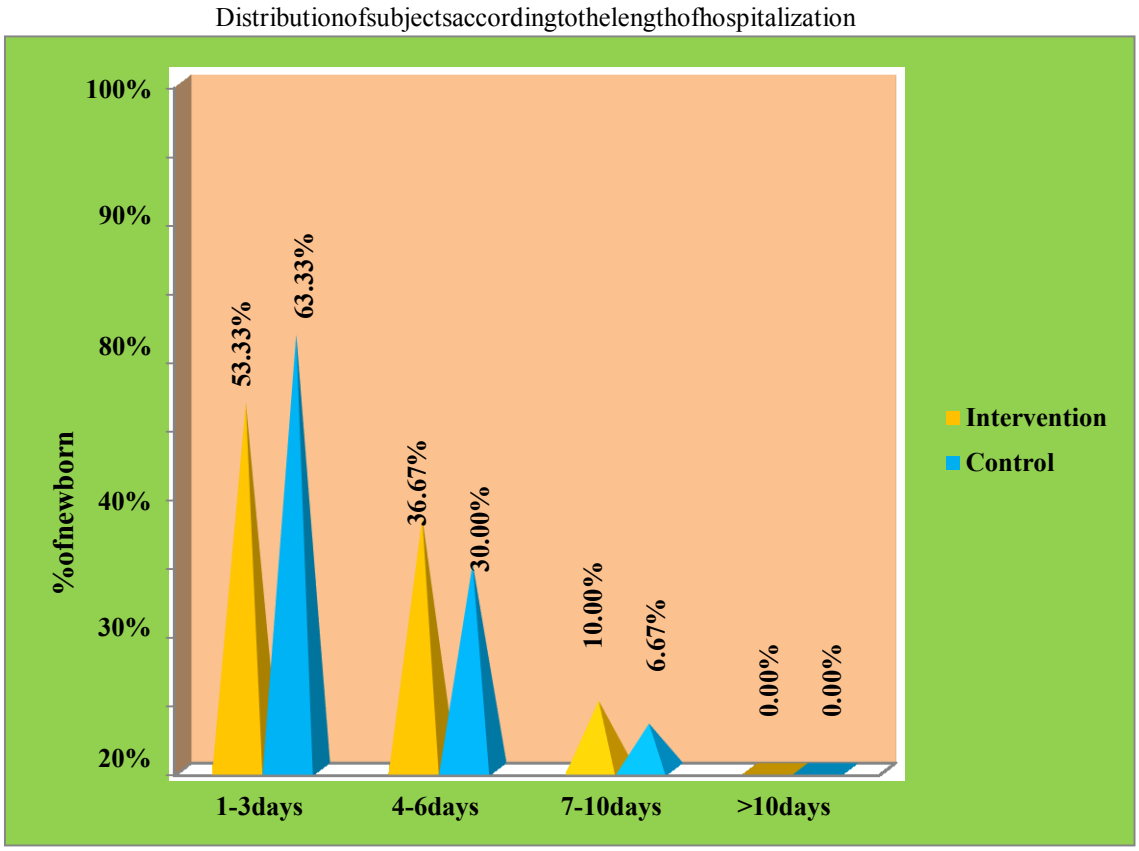


Figure11:-Clusteredpyramiddiagramrevealsthedistributionofsubjectsduringheelprick according totheir lengthofhospitalization

Theaboveclusteredpyramiddiagramshowsthat,ininterventiongroupmajority of the subjects, 16 (53.33%) were had between 1-3 days, 11 (36.67%)werehadbetween4-6daysand3(10.00%)werehadbetween7-10days,noneofthemhadmorethan10days,whereasincontrolgroupmajority ofthesubjects19(63.33%)werehadbetween1-3days,9(30.00%)werehadbetween4-6daysand2 (6.67%) were had between 7-10 days. noneof them had morethan 10 days.

Distributionofsubjectsaccordingtothepositionof newbornduringheelprick

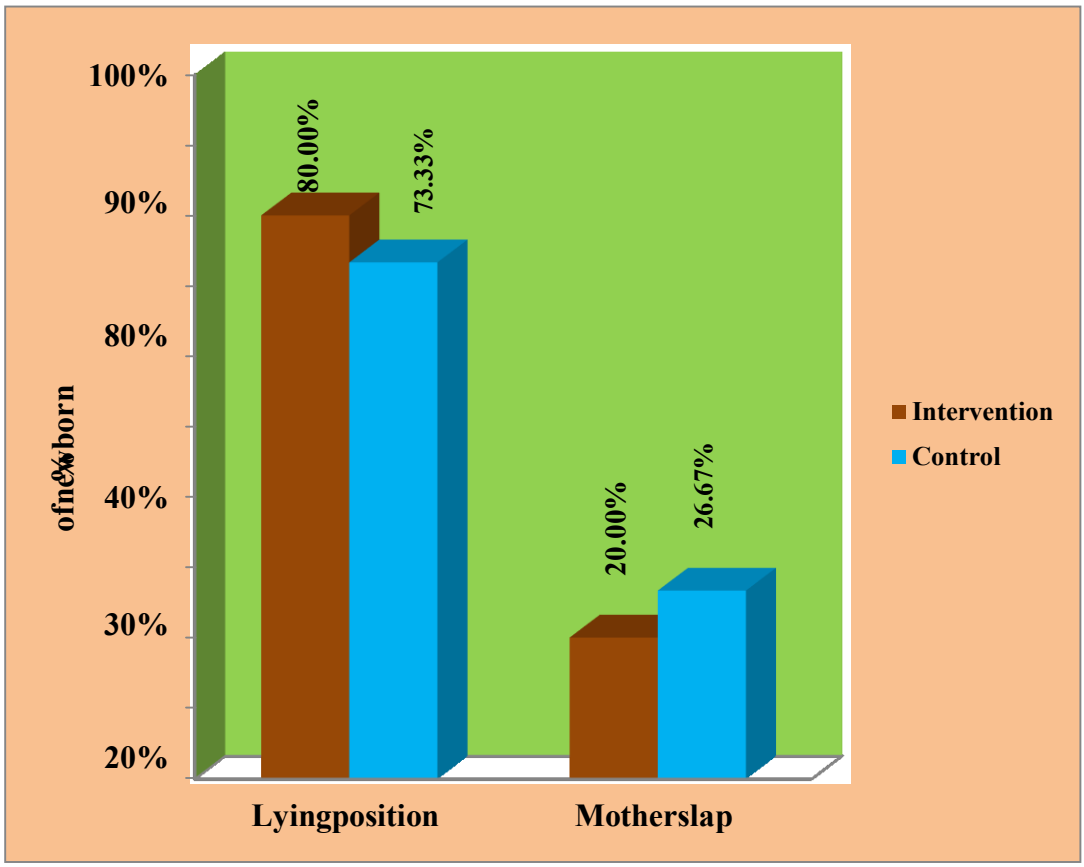


Figure 12:- 3D bar diagram depicts the distribution of subjects according to theposition ofchildduringheel prick

The above 3D bar diagram shows that, in intervention group majority of thesubjects, 24 (80.00%) were in lying position and 6 (20.00%) were in mother's lap,whereasincontrolgroupmajorityofthesubjects,22(73.33%)wereinlyingposition, 8 (26.67%) were in mothers lap.

Description of the post test level of pain response during heel prick amongnewborninboth interventionand control group

Table2:-FrequencyandPercentagedistributionofposttestlevelofpainresponseduringheelprick amongnewborn inboth interventionand controlgroup.**n=60**

S.No	Levelof pain	Intervention group		Controlgroup		χ2
		f	%	f	%	
1.	0-2(nopain –mild pain)	18	60.00%	5	16.67%	$\chi 2^{=}$17.68 p=0.001***(S)
2.	3-4(moderatepain)	12	40.00%	15	50.00%	
3.	5-7(severepain)	0	0	10	33.33%	

p≤0.001highlysignificantS=significant

The above table 2states the frequency andpercentage distribution ofposttestlevelofpainresponseduring heel prickamongNewborninbothinterventionand control group. In intervention group majority of the subjects, 18 (60.00%) were had betweenno pain to mild pain, 12 (40.00%) werehad moderate pain, none of them had severepain.

Whereas in control group, majority of the subjects 15 (50.00%) were hadmoderate level of pain and 10 (33.33%) were had severe pain, 5 (16.67%) were hadbetween no painto mild pain.

Chi square test revealed that **$\chi 2^{=}$17.68 at p=0.001** level**.**There is statisticallysignificance difference between post test level of pain response of intervention andcontrol group.

Frequency and Percentage distribution of post test level of pain response duringheelprickamongnewborn inbothintervention andcontrolgroup

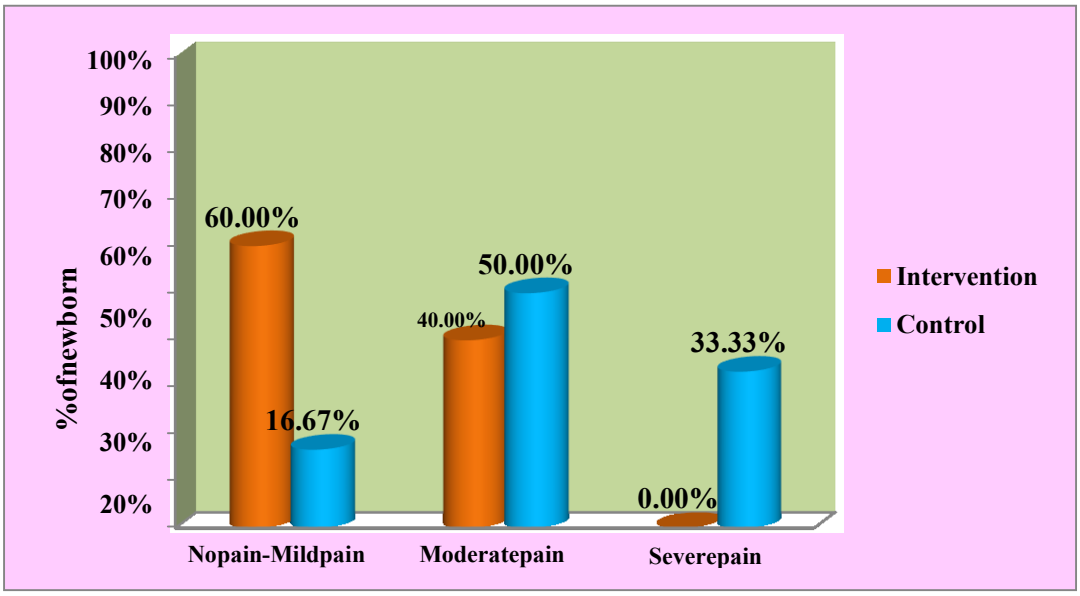


Figure 13:- Clustered cylinder diagram states thatFrequency and Percentagedistribution of post test level of pain response during heel prick among newborninbothintervention and control group

In intervention group majority of the subjects, 18 (60.00%) were had betweenno pain to mild pain, 12 (40.00%) were had moderate pain, none of them had severepain.

Whereas in control group, majority of the subjects 15 (50.00%) were hadmoderate level of pain and 10 (33.33%) werehad severe pain, 5 (16.67%) were hadbetween no pain to mild pain .

Chi square test revealed that **$\chi 2^{=}$17.68 at p=0.001** level. There is statisticallysignificance difference between the post test level of pain response during heel prickamongnewborn in intervention and controlgroup.

SectionII

Effectiveness of warm saline water application on pain response during heelprickamongnewbornbothinInterventiongroupandControlGroupTable 3

Comparison of mean score, standard deviationand mean differenceofpost testlevel of pain responseduring heel prick among newborninbothinterventionandcontrol group

S.No	Testgroup	Mean	Mean difference	Standard deviation	't'value
1.	Interventiongroup	2.27	1.73	1.01	**t=5.25 p=0.001*** (S)**
2.	Controlgroup	4.00		1.50	

p<0.05significantS=significant

The abovetable 3 depicts theComparison of mean score, standarddeviationand mean differenceofpost test level of pain responseduring heelprickamong newborninbothintervention and controlgroup

The un paired‘t’ test was done to find out the difference between interventiongroup and control group. In intervention group, the mean was 2.27 with standarddeviation1.01,whereasincontrolgroup,themeanwas4.00withstandarddeviation1.50.Themeandifferenc ewas1.73.Thecalculated ‘t’value**5.25 atp=0.001**.

Therewasasignificantdifferencebetweenposttestlevelofpainresponseinintervention and controlgroup.

Comparison of mean score, standard deviationand mean differenceofpost testlevel of pain response during heel prick among newborn in both interventionand control group

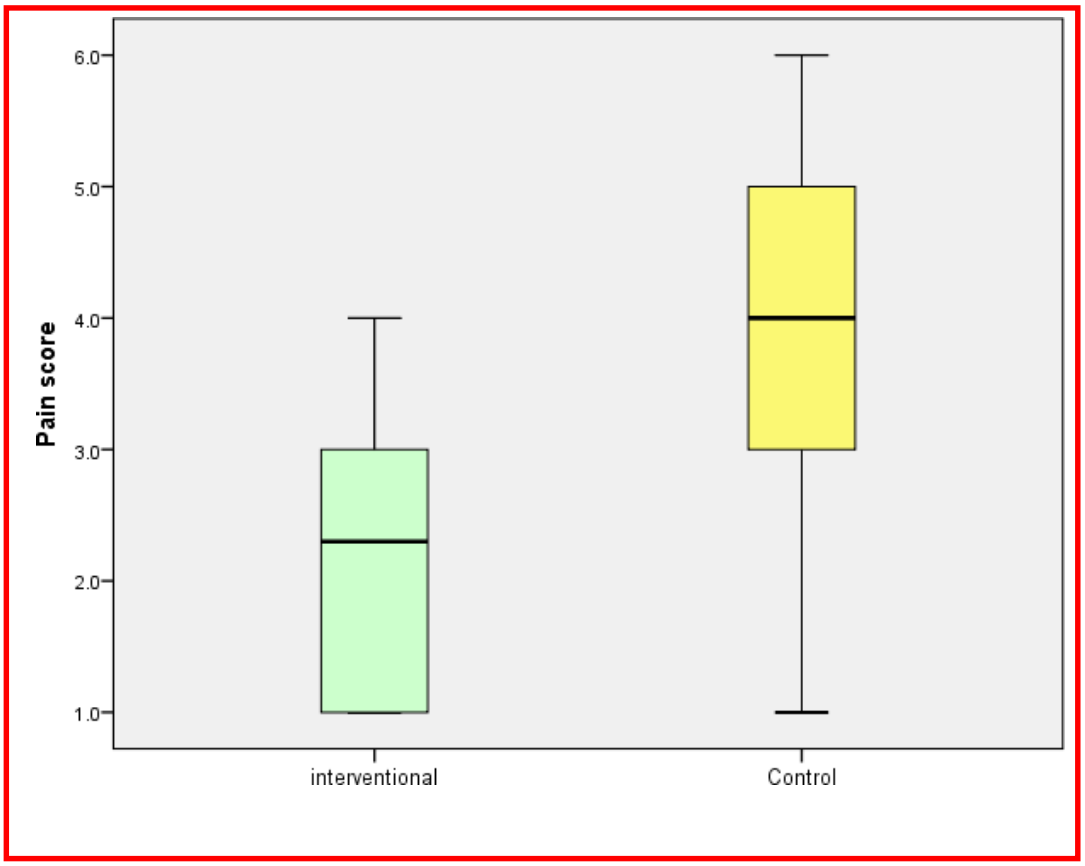


Figure 14:- Box-plot diagram compares the mean score , standard deviationandmean differenceofpost test level of pain responseduring heel prick amongnewborninbothintervention and control group

The un paired‘t’ test was done to find out the difference between interventiongroup and control group. In intervention group, the mean was 2.27 with standarddeviation1.01,whereasincontrolgroup,themeanwas4.00withstandarddeviation1.50.Themeandifferenc ewas1.73.Thecalculated ‘t’value**5.25 atp=0.001**.

Therewasasignificantdifferencebetweenposttestlevelofpainresponseinintervention and controlgroup.

Table4:-Effectiveness of warm saline water application on pain response during heelprickamongnewborninterventiongroup andcontrol groupn=60

	Maxsc	Meansc	%	Mean DifferenceofPainreduct	PercentageofPain reductionscore

	ore	ore	ofpains core	ionscore with 95%Confidenceinterval	with 95%Confidenceinterval
Intervention	7	2.27	32.42%	1.73	24.71%
Control	7	4.00	57.14%	(1.07– 2.39)	(15.28%–34.12%)

Theabovetable4potraystheeffectivenessofWarmSalineWaterapplicationon painresponse during heelprickamongnewbornat NICU ininterventionand control group.

On an average, in intervention group, the post test level of pain score afterhaving warm saline water application was 32.42%, whereas in control group, the post-test level of painscorewithoutwarm salinewaterapplication was 57.14% .

The mean difference of pain reduction score with95% Confidence Intervalwas 1.73 and percentage of pain reduction score with 95% Confidence Interval was24.71%.

The difference showed that, the effect of warm saline water application inintervention group and control group.

Section –III

Association between the level of pain response during heel prick among newbornwiththeirbaselinevariables inbothintervention groupand controlgroup

Table– 5:-Associationbetweenthepost testlevelofpainresponseduringheelprickamongnewbornwith theirbaselinevariablesinintervention groupn=30

Baselinevariables		Levelof pain score						N	χ^2
		Nopain		Mildto moderatepain		Severe pain			
		f	%	f	%	f	%		
Age of thebaby	1-7days	12	57.14%	9	42.86%	0	0.00%	21	$\chi2$=0.53 P=0.76(NS)
	8-14days	5	71.43%	2	28.57%	0	0.00%	7	
	15-22days	1	50.00%	1	50.00%	0	0.00%	2	
	23-28days	0	0.00%	0	0.00%	0	0.00%	0	
Genderof the baby	Male	8	57.14%	6	42.86%	0	0.00%	14	$\chi2$=0.09 p=0.77(NS)
	Female	10	62.50%	6	37.50%	0	0.00%	16	
Weight of thebaby	2.5-3 kg	7	53.85%	6	46.15%	0	0.00%	13	$\chi2$=2.99p=0.37(NS)
	3.0-3.5 kg	5	50.00%	5	50.00%	0	0.00%	10	
	3.5 –4.0 kg	3	75.00%	1	25.00%	0	0.00%	4	
	>4.0kg	3	100%	0	0.00%	0	0.00%	3	
	Normal vaginald elivery	10	71.43%	4	28.57%	0	0.00%	14	
	Caesarean section	8	53.33%	7	46.67%	0	0.00%	15	$\chi2$=2.54p=0.

Modeof delivery	Instrumental delivery	0	0.00 %	1	100.00 %	0	0.00 %	1	28(NS)
	Ventous delivery	0	0.00 %	0	0.00%	0	0.00 %	0	
Gestationalweek duringbirth	35-36weeks	2	66.67%	1	33.33%	0	0.00%	3	χ2=0.21p =0.97(NS)
	37-38weeks	5	55.56%	4	44.44%	0	0.00%	9	
	39-40 weeks	7	63.64%	4	36.36%	0	0.00%	11	
	>40weeks	4	57.14%	3	42.86%	0	0.00%	7	
APGARscoreat5 min	<3	0	0.00%	0	0.00%	0	0.00%	0	χ2=2.53p =0.28(NS)
	4-6	3	75.00%	1	25.00%	0	0.00%	4	
	7-10	14	63.64%	8	36.36%	0	0.00%	22	
	Not available	1	25.00%	3	75.00%	0	0.00%	4	
Baby admitted in	Level I	10	50.00%	10	50.00%	0	0.00%	20	χ2=2.50 p=0.11(NS)
	Level II	8	80.00%	2	20.00%	0	0.00%	10	
Modeoffeeding	Directbreast feeding	16	72.72%	6	27.28%	0	0.00%	22	**χ2=5.89p= 0.05*(S)**
	Direct breastfeeding andexpressed breastmilk	1	20.00%	4	80.00%	0	0.00%	5	
	Expressed breastmilk	1	33.33%	2	66.67%	0	0.00%	3	
	Expressedbreast milk andIVfluid	0	0.00%	0	0.00%	0	0.00%	0	
Timeoflastfeed	Lessthan 15 mins	4	100.00%	0	0.00%	0	0.00%	4	**χ2=8.03p= 0.05*(S)**
	15 mins– 30 mins	6	75.00%	2	25.00%	0	0.00%	8	

	30mins -1 hrbefore	6	54.55%	5	45.45%	0	0.00%	11	
	Morethan1 hour	2	28.58%	5	71.42%	0	0.00%	7	
Length ofhospitalization	1-3days	11	68.75%	5	31.25%	0	0.00%	16	χ2=1.53p=0 .46(NS)
	4-6days	6	54.55%	5	45.45%	0	0.00%	11	
	7-10days	1	33.33%	2	66.67%	0	0.00%	3	
	>10days	0	0.00%	0	0.00%	0	0.00%	0	
Positionofne wborndurin g heelprick	Lying position	12	50.00%	12	50.00%	0	0.00%	24	**χ2=7.40p= 0.01*(S)**
	Motherslap	6	100.00%	0	0.00%	0	0.00%	6	

NS=notsignificantS=SignificantP>0.05not significant*P≤0.05 significant

The above table 5depictsthereis a association betweenposttest levelofpainresponse during heel prickamong newbornwiththeirselectedbasevariablesinintervention group.

In ordertofindouttheassociationbetweentheposttestlevelofpainresponseduringheelprickamongnewborninintervention groupwiththeirselectedbaselinevariables,Chisquarerevealedthat,therewasastatisticallysignificant association between the level of pain response and Direct breast feeding,**(χ2=5.89) (p=0.05),** Time of last feedless than 15 minutes **(χ2=8.03)(p=0.05),**Position of babyduringheel prick is mother's lapposition **(χ2=7.40)(p=0.01)**.

Other variableswere notsignificantly associatedwiththeposttest levelofpain response duringheel prick among newborn in intervention group.

Association between the posttest level of pain responseduring heel prickamongnewborn withtheirmodeof feeding

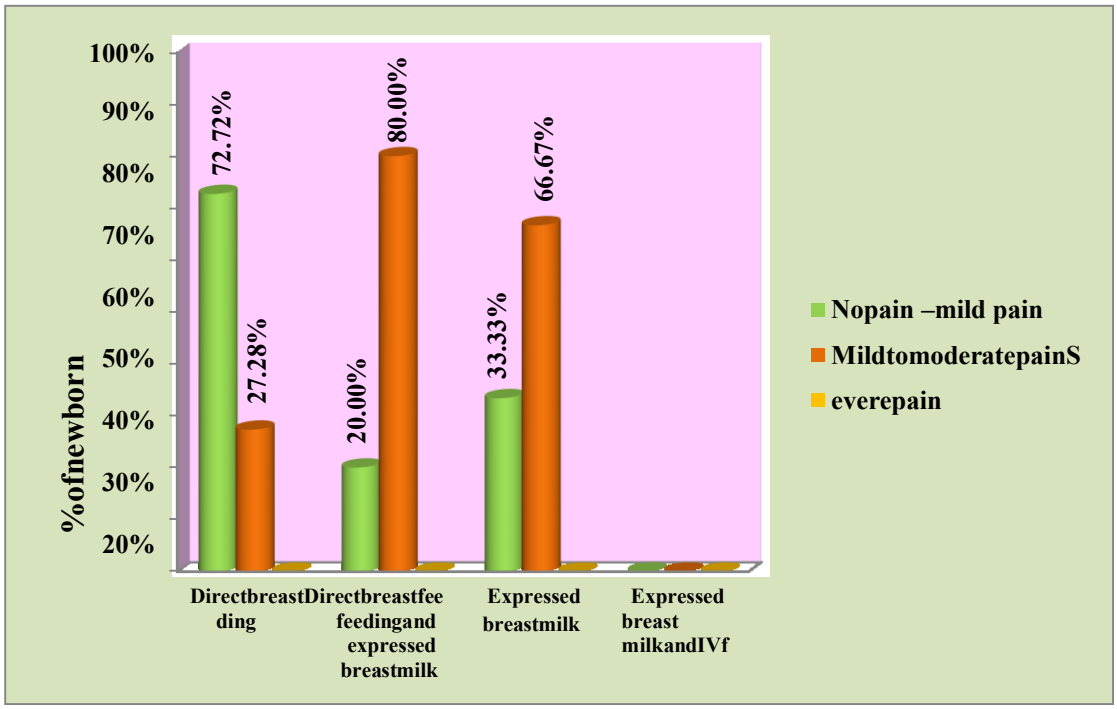


Figure 15: Clustered cylinder depicts that Association between the post test levelof pain response during heel prick among newborn withmode of feeding ininterventiongroup

Chi square revealed that, there was statistically significant association betweenlevel of pain response during heelprick among newborn with direct breast feeding($\chi 2=5.89$) **(p=0.05),** whereas other mode of feeding was not associated to the post testlevel of pain response amongnewborn undergoneheel prick.

Association between the post test level of pain responseduring heel prick amongnewbornwith their timeoflast feed

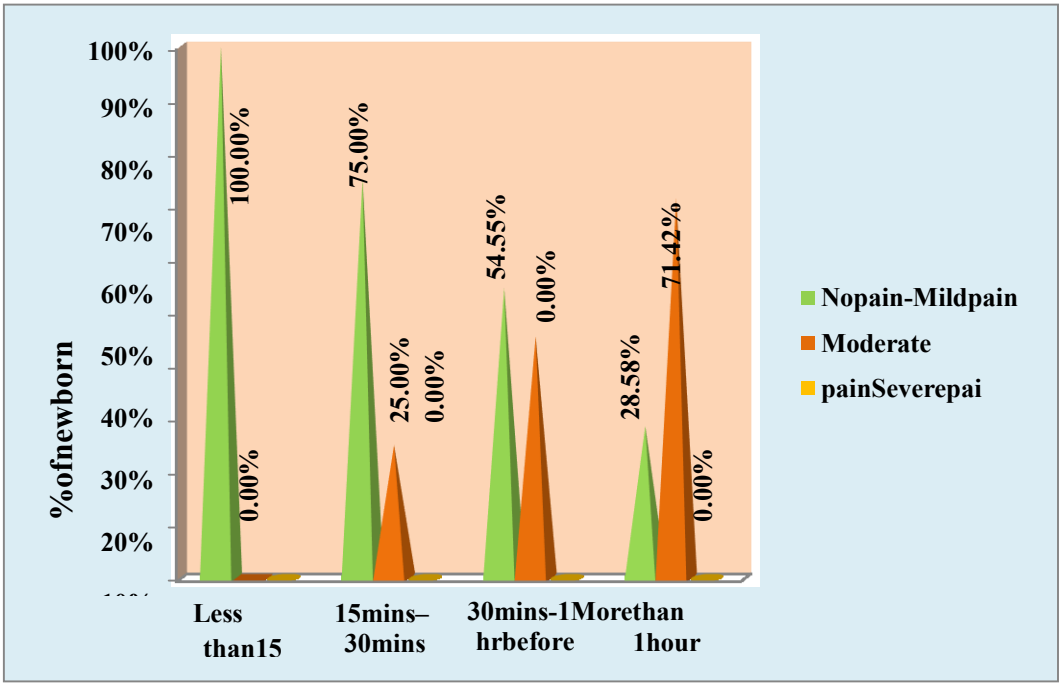


Figure 16:- Clustered pyramid diagram depicts that association between the posttest level of pain response during heel prick among newborn with their time oflastfeedinintervention group

Chi square revealed that,there was statistically significant association betweenlevel of pain responseduring heelprick among newborn with theirtime of last feedless than15 minutes ($\chi 2=8.03$)**(p=0.05),** whereas other time of last feed were notassociated to the post test level ofpain response among newborn undergone heelprick.

Association between the post test level of pain response during heel prick amongnewbornwithpositionofthe child

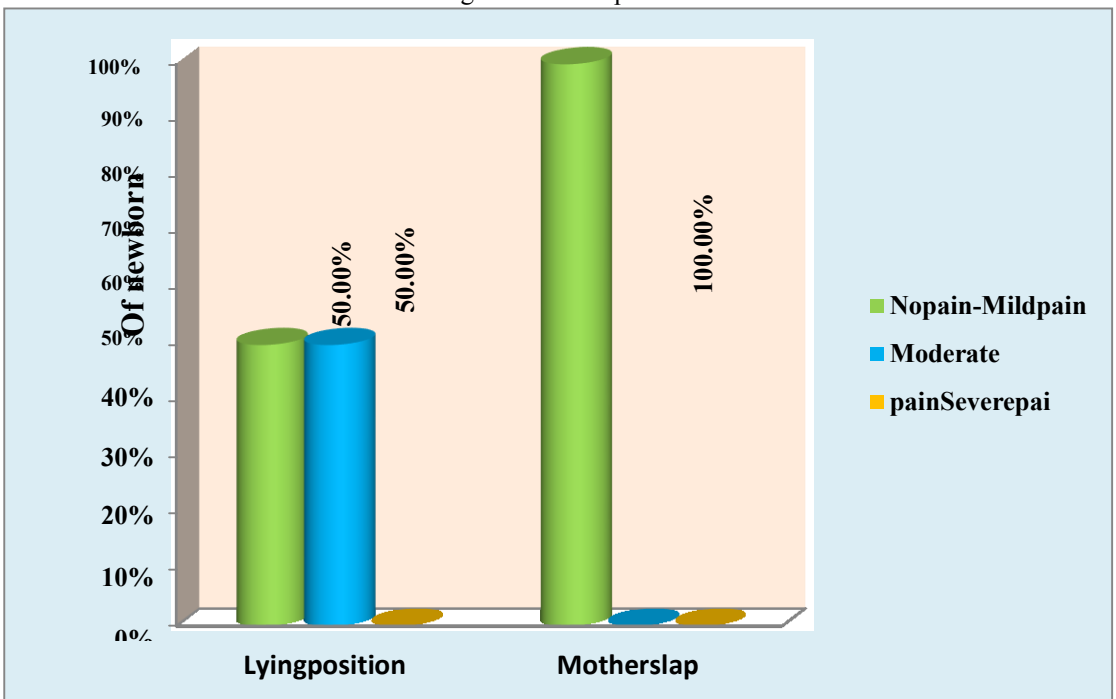


Figure 17:- Clustered cylinder depicts that association between the post test levelof pain response during heel prick among newborn with position of child ininterventiongroup

Chi square revealed that**,** there was statistically significant association betweenlevel of pain response during heel prick among newborn with mother's lap position(**$\chi 2=5.89$) (p=0.05),** whereas other position was not associated to the post test level ofpain responseamongnewborn undergone heel prick.

Table-6:-Association between the post test level of pain response during heel prick amongnewbornwith theirbase line variables inControl groupn=30

Demographicvariables		Levelof pain score						N	$\chi 2$
		Nopain		Mildto moderate pain		Severe pain			
		f	%	f	%	f	%		
Age of thebaby	1-7days	2	10.00 %	10	50.00%	8	40.00 %	20	$\chi 2=3.30p=0.50$(NS)
	8-14days	2	25.00 %	4	50.00%	2	25.00 %	8	
	15-22days	1	50.00 %	1	50.00%	0	0.00%	2	
	23-28days	0	0.00%	0	0.00%	0	0.00%	0	
Genderof thebaby	Male	0	0.00%	8	53.33%	7	46.67 %	15	**$\chi 2=6.66$ p=0.03*(S)**
	Female	5	33.33 %	7	46.67%	3	20.00 %	15	
Weight of thebaby	2.5-3 kg	1	9.09%	4	36.36%	6	54.55 %	11	$\chi 2=8.93p=0.17$(NS)
	3.0-3.5 kg	4	33.33 %	5	41.67%	3	25.00 %	12	
	3.5 –4.0 kg	0	0.00%	3	75.00%	1	25.00 %	4	
	>4.0kg	0	0.00%	3	100.00 %	0	0.00%	3	
Modeofd elivery	Normalvaginal delivery	0	0.00%	8	61.54%	5	38.46 %	13	$\chi 2=6.17p=0.18$(NS)
	Caesarean section	5	31.25 %	6	37.50%	5	31.25 %	16	
	Instrumental delivery	0	0.00%	1	100.00 %	0	0.00%	1	
	Ventous delivery	0	0.00%	0	0.00%	0	0.00%	0	
Gestationalweek duringbirth	35-36weeks	0	0.00%	1	100.00%	0	0.00%	1	$\chi 2=3.57p=0.73$(NS)
	37-38weeks	2	22.22%	5	55.56%	2	22.22%	9	
	39-40weeks	1	7.69%	6	46.15%	6	46.15%	13	
	>40weeks	2	28.57%	3	42.86%	2	28.57%	7	
APGARscore at5min	<3	0	0.00%	0	0.00%	0	0.00%	0	$\chi 2=1.96p=0.74$(NS)
	4-6	0	0.00%	3	75.00%	1	25.00%	4	

	7-10	4	17.39%	11	47.83%	8	34.78%	23	
	Notavailable	1	33.33%	1	33.33%	1	33.33%	3	
Baby admittedin	Level I	4	17.39%	12	52.17%	7	30.43%	23	$\chi2=0.37p=0.82$(NS)
	Level II	1	14.28%	3	42.86%	3	42.86%	7	
Modeoffeeding	Directbreast feeding	4	17.39%	12	52.17%	7	30.43%	23	$\chi2=0.78p=0.94$(NS)
	Direct breastfeeding andexpressed breastmilk	1	20.00%	2	40.00%	2	40.00%	5	
	Expressed breastmilk	0	0.00%	1	50.00%	1	50.00%	2	
	Expressed breastmilkandIV fluid	0	0.00%	0	0.00%	0	0.00%	0	
Timeoflastfeeding	Lessthan 15 mins	4	57.14%	3	42.86%	0	0.00%	7	**$\chi2=13.40p=0.05$*(S)**
	15 mins – 30 mins	0	0.00%	5	50.00%	5	50.00%	10	
	30mins-1 hr before	1	14.29%	3	42.86%	3	42.86%	7	
	Morethan1 hour	0	0.00%	4	66.67%	2	33.33%	6	

Length ofhospitalization	1-3days	3	15.79%	9	47.37%	7	36.84%	19	$\chi2=2.32p=0.67$(NS)
	4-6days	2	22.22%	4	44.44%	3	33.33%	9	
	7-10days	0	0.00%	2	100.00%	0	0.00%	2	
	>10days	0	0.00%	0	0.00%	0	0.00%	0	

Positionofnewborndurin g heelprick	Lyingposition	1	4.54%	13	59.09%	8	36.36%	22	**χ2=8.86p=0.01**(S)**
	Motherslap	4	50.00%	2	25.00%	2	25.00%	8	

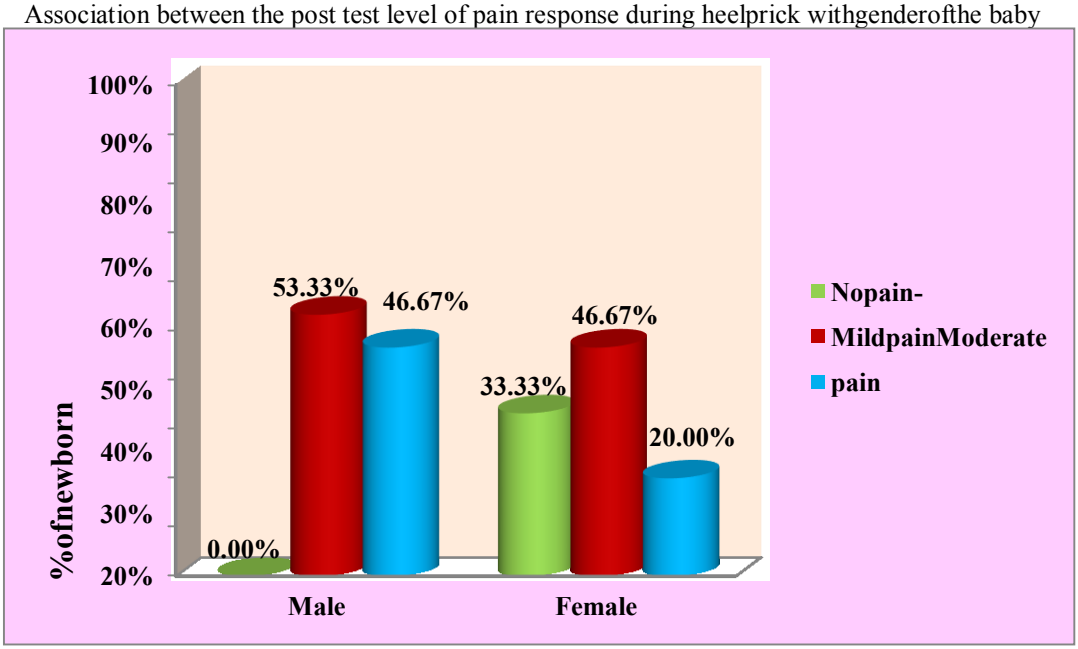
NS=notsignificantS=SignificantP>0.05not significant*P≤0.05 significant

The above table6depicts thatthereis asignificant associationbetweenpost test level ofpain responseduring heel prickamong newbornwiththeirselected basevariables in thecontrol group.

In ordertofindouttheassociationbetweenthepost testlevelofpainresponse during heel prick among newborn in interventiongroupwiththeirselectedbaselinevariables,Chisquarerevealedthattherewasstatisticallysignificantas sociation between the level of pain response and female gender **(χ2=6.66) (p=0.03),**Time of last feedless than 15 minutes **(χ2=13.40) (P=0.05),** Position of the babyduringheelprick is mother's lap position**(χ2=8.86) (p=0.01).**

Other variables was not significantly associated with post test level of painresponse duringheel prick amongNewborncontrolgroup.

Association between the post test level of pain response during heelprick withgenderofthe baby



Chi square revealed that**,** there was statistically significant association betweenlevel of pain response during heelprick among newborn with female gender **(χ2=5.89)(p=0.05).**

Association between the post test level of pain response during heel prick amongnewbornwith thetimeoflast feed

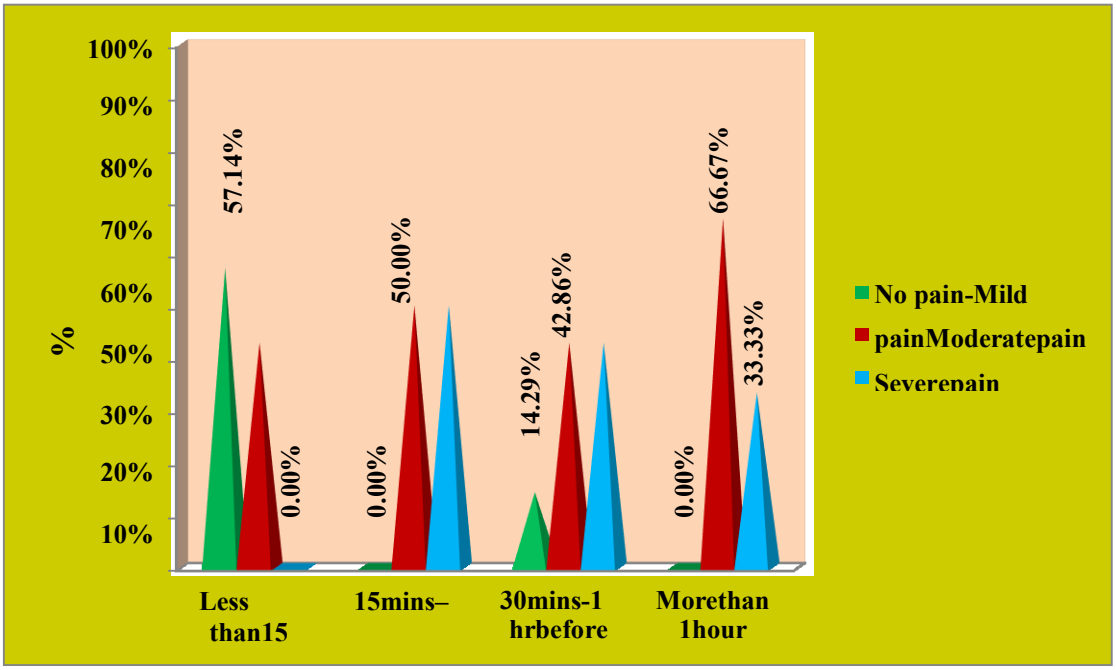


Figure 19:- Clustered pyramid diagram depicts that association betweenthe posttestlevel of pain response during heel prick amongnewborn with time of lastfeed incontrolgroup.

Chi square revealed that, there was statistically significant association betweenlevel of pain responseduring heelprick among newborn with theirtime of last feedless than15 minutes **(χ2=13.40) (p=0.05),** whereas othertime of last feed werenotassociated to the post test level of pain response among newborn undergone heelprick in controlgroup.

Association between the post test level of pain response during heelprick amongnewbornwithpositionofchild

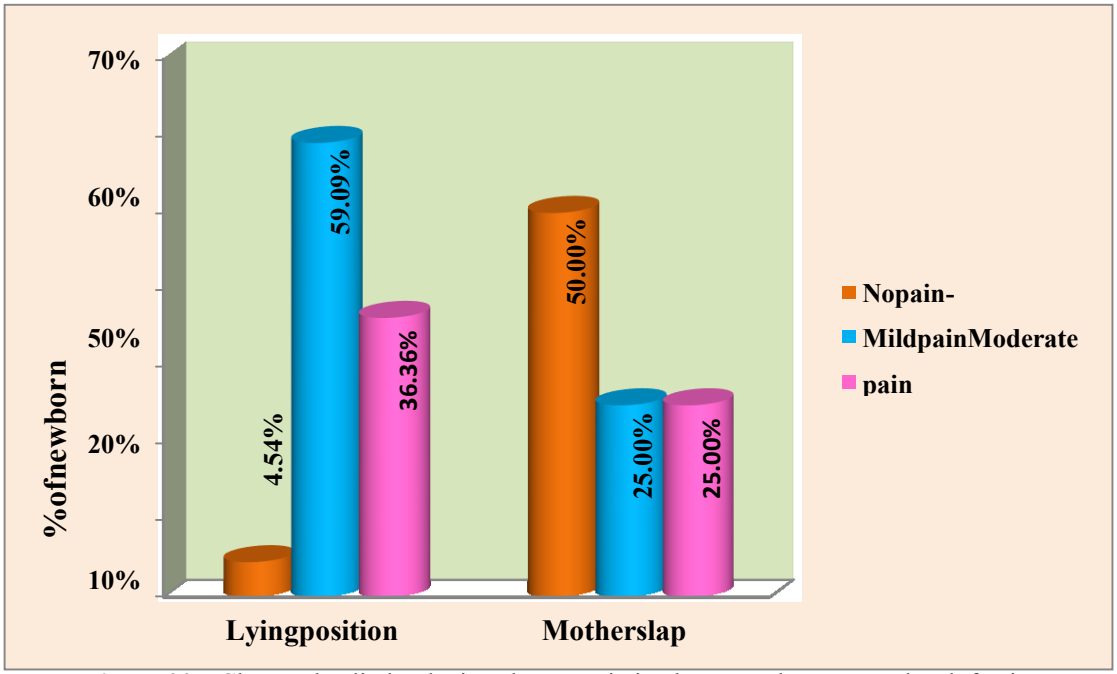


Figure 20:- Clustered cylinder depicts that association between the post test levelof pain response during heel prick among newborn with Position of the baby incontrolgroup

Chisquarerevealedthat,therewasastatisticallysignificantassociationbetween level of pain responseduring heel prick among newborn withmother's lapposition **(χ2=8.86) (p=0.01)**.Whereas other position was not associated to the post testlevel of painresponse duringamongnewborn duringheel prick.

Discussion:-

Chapter – VDiscussion

Thischapterdiscussedabouttheresultofthestudyinterpretedfromthestatistical analysis. The study was conducted to evaluate the effectiveness of warmsaline water application on pain response during heel prick among Newborn. Thepurposeofthisstudy wastoreducethelevelofpainresponseamongnewbornundergoingheel prickamongNewborn.

The aim of the study was to evaluate the effectiveness of warm saline waterapplication to reduce level of pain response among newborn undergone heel prick atNICU. The sample size for this study was 60(intervention group-30, control group-30).The investigator applied warm saline gauze pad for 2 minute before heel prick forintervention group and blood sample was taken.In control group routine care wasgiven.The pain duringheel prick wasassessed byNeonatalInfant Pain Scale.

The statistical analysis was done based on objectives of the study by usingdescriptive and inferential statistical methods. The findings of the study have beendiscussed. In this chapter with reference to the objectives and hypothesis stated inintroduction.

Theobjectivesof the studywere
Toassessthelevelofpainresponseduringheelprickamong NewbornatNICU, Government Rajaji Hospital, Madurai.
Toevaluatetheeffectivenessofwarmsalinewaterapplicationonpainresponseduringheelprickamongnewborn,bothinInterventionalGroupandControlGroup atNICU ,Government RajajiHospital, Madurai

To associatethepain response during heel prick amongNewborn atNICU,GovernmentRajajiHospital,Madurai,withtheirselectedbaselinevariables

ThefollowingHypotheseswereretestedat 0.05levelofsignificance

1. **H1:** There is a statistically significant difference between the posttest level ofpain response during heel prick among newborn,both in Interventional GroupandControl Group atNICU, Government RajajiHospital, Madurai.
2. **H2:** There is astatistically significant association between the level of painresponseduringheelprickamongNewbornatNICU,GovernmentRajajiHospital,Madurai with theirselected Baselinevariables

Thefindingsofthestudyworediscussedunderthefollowingheadings
Section I: Distribution ofnewbornaccordingto their selected base line variables.
Section II: Description of effectiveness of warm saline water application on painresponseduringheel prick amongnewbornin intervention group.
Section III: Associationbetweenthelevelofpainresponseduringheelprickamong newborn in intervention group and control group with theirselected base line variables.

Discussion based on the newborn during heel prick according to theirselectedbaselinevariables

1. **Withrespecttoage**,ininterventiongroup,21(70.00%)werehadbetween1-7days, whereasin controlgroup,20(66.7 %) werehad between 1-7days.
2. **When dealing with gender**, in intervention group, 16 (53.33 %) were femalesand15 (50%)weremalesin control group.
3. **While discussing the weight of the baby**, in intervention group, 13 (43.33%)were had between 2.5-3 kg and 12 (40.00%) were had between 3-3.5 kg incontrol group.
4. **While considering the mode of delivery**, in intervention group and controlgroup 15 (50.00%) and 16 (53.34%) respectively were delivered by caesareansection.
5. **With regards to the gestational week during birth**, in intervention group 11(36.67%)and13(43.34%)in controlgroupweredeliveredat 39-40weeks.
6. **AsfarasconcerntotheApgarscoreat5min**,ininterventiongroup,majority of the subjects 22 (73.33%) and 23 (76.67%) in control group werehadbetween 7-10 scores.

7. **Whilediscussingthebabyadmittedinthelevel**,ininterventiongroup,
8. 20(66.67%)wereadmittedin Level I,whereasin thecontrol group23 (76.67%) admitted inLevelI
9. **When dealing with Mode of feeding**, in intervention group majority of thesubjects22(73.33%)were haddirectbreastfeedingbutincontrolgroup23(76.67%)werehad directbreast feeding.
10. **While mentioning the time of last feed**, in intervention group, 11 (36.67%)were had between 30 minute – 1 hour, whereas in control group 10 (33.34%)werehad between 15 minutes -30 minutes.
11. **While stating the length of hospitalization**, in intervention group majority ofthesubjects,16(53.33%)werehadbetween1-3days,butinControlgroup19(63.33%) werehad between 1-3 days
12. **With respect to the position of child during heel prick**, in interventiongroup, 24 (80.00%) were in lying position, whereasin control group majorityofthesubjects, 22(73.33%) werein lyingposition

Discussionofthestudybasedontheobjectives:-

The first objective of the study was to assess the level of pain responseduringheelprickamongNewbornatNICU,GovernmentRajajiHospital,Madurai.

In intervention group majority of the subjects, 18 (60.00%) were had betweenno pain to mild pain, whereas in control group, 15 (50.00%) were had moderate levelof pain response

Chisquaretestrevealedthat$\chi 2^{=}$**17.68atp=0.001level.**Therewasastatistically significant difference between post test score of intervention and controlgroup.

The present study is concurrent with the study findings at **Gokulu G., et.al(2016)**conductedacomparativestudyonheelstickamong60newborninfantsundergone heel prick for screening in Marmara hospital, Turkey. The result showedthatafterheelprickthecryingtime(p=0.021)andNIPS(0.013)Scoresweresignificantly higher in the study group and babies who received more painful stimuliduring the first few days of life showed greater pain responses during a subsequentheel prick.

The second objective of this study was to evaluate the effectiveness of warmsaline water application on pain response during heel prick among newborn, both inInterventiongroupandControlGroupatNICU,GovernmentRajajiHospital,Madurai.

The un paired 't' test revealed that in intervention group,the meanwas2.27with standard deviation 1.01, whereas in control group,the mean was4.00 withstandard deviation 1.50. The mean difference was 1.73.The calculated 't' value **5.25at p = 0.001**.

The present study is concurrent with the study findings at **Neil McIntosh(2003)** conducted a study on the pain of heel prick and its measurement in preterminfants.Therewasa significantincreaseinvariability ofthe heart rate(p <0.01)when the stab of the heel prick occurred in addition to the other elements of theprocedure(positioning,warming,alcoholswabcleansingandsqueezing).Thisdummy procedure itself caused some increase in variability although this was notsignificantatthe5%level.Thereweresimilarsignificantincreasesinvariabilityofthe respiratory rate and O_2 and CO_2 tensions in the blood ($p < 0.05$) during the stabprocedure.

Hence H1: There is astatistically significantdifferencebetweenthe posttestlevelofpainresponseduringheelprickamongnewborn,bothinIntervention group and Control Group at NICU, Government Rajaji Hospital,Maduraiwas accepted and null hypothesiswasrejected.

The third objective of this study was to associate the pain response duringheel prick among Newborn at NICU, Government Rajaji Hospital, Madurai, withtheir selected base line variables.

In ordertofindouttheassociationbetweenthepostestlevelofpainresponse during heel prick among newborn in interventiongroupwiththeirselectedbaselinevariables.Chisquarerevealedthat,therewasstatisticallysignificantassociation betweenthelevelofpainresponseandDirectbreastfeeding,(**$\chi 2=5.89$)(p=0.05),** Time of last feed less than 15 minutes (**$\chi 2=8.03$) (p=0.05),** Position of babyduring heel prick is mother's lap position (**$\chi 2=7.40$) (p=0.01)**, whereas in controlgroupthere wasstatisticallysignificantassociationbetweenthelevelofpainresponse and female gender **($\chi 2=6.66$)**

(p=0.03), Time of last feedless than 15minutes **(χ2=13.40) (P=0.05)**, Position of the baby during heel prick is mother's lapposition **(χ2=8.86) (p=0.01).**

Other variables were not significantly associated with post test level of painresponse duringheel prick amongNewbornincontrol group

The present study is concurrent with the study findings at **Varshini et. al.,(2019)** conducted arandomized clinicaltrialon Effects of yakson therapeutic touchand heel warming on pain caused by heel stick procedure, vital signs, and cry durationin full-term neonates. to compare the effects of Yakson therapeutic touch and heelwarming on paincaused by heel stick procedure, vital signs, and cry duration in full-termneonateshealthcarecentersinMashhad,Iran,2017.78full-termnewbornsreferred to they were assigned into three groups of Yakson therapeutic touch, heelwarming using a hot-water bottle with the temperature of 40°C, and control receivingroutine care, through randomized block method. Then, vital signs before and after andpain intensity after heel-stick procedure were measured using Neonatal Infant PainScale (NIPS).This studyconcluded that the interventions were effective. (p=0.03).

Hence H2: There is astatistically significant association between the levelof pain response during heel prick among Newborn at NICU, Government RajajiHospital, Maduraiwith their selected Base line variableswas accepted and nullhypothesiswas rejected.

Summary,Conclusions AndRecommendations:-

CHAPTER–VI

This chapter deals with summary, conclusion and recommendations of thestudy.FurtheritincludesimplicationsforNursingPractice,NursingEducation,NursingAdministration and Nursing Research.

Newborns are more sensitive to pain than adults and are more susceptible tothe long-term complications of pain. A challenging issue in the realm of neonatal careis procedural pain management.In the past, whether infants feel pain and how paincan be decreased inthem were inconspicuous.Much evidence suggested that earlyand prolonged exposure to painful stimuli before the development of the nervoussystem, can lead to permanent behaviorchanges.

Heel prick is one of the most common procedures carried out in newborns inboth sick and well newborns. Though it is considered to be moderately painful, thecumulative pain due to a heel prick could be tremendous, making pain reductionduring this procedure an urgent priority, using non-pharmacological procedures asmuch as possible. An intervention that is natural, cost-effective and has no ill-effectswouldbeidealforuseinprimarycaresettingsforinfantsreceivingheelprick.Research has shown that warmth is a natural and effective intervention to decreasepain perception in infants duringpainful situations.

Summaryofthestudy

The present study was done to evaluate the effectiveness of warm saline waterapplication on pain response during heel prick among newborn at NICU, GovernmentRajaji Hospital, Madurai.

Theobjectivesof thestudywere

1. To assess the level of pain response during heel prick among Newborn atNICU, Government Rajaji Hospital, Madurai.
2. To evaluate the effectiveness of warm saline water application on painresponse during heel prick among newborn , both in Interventional GroupandControl Groupat NICU,GovernmentRajajiHospital, Madurai.
3. ToassociatethepainresponseduringheelprickamongNewbornatNICU, Government Rajaji Hospital, Madurai, withtheir selected baselinevariables.

Thefollowinghypotheseswereretestedat0.05levelof significance.

1. **H 1:** There is astatistically significantdifference between the post testlevelofpainresponseduringheelprickamongnewborn,bothinInterventionalGroupandControlGroupatNICU, GovernmentRajajiHospital,Madurai.
2. **H2:** There is a statistically significant association between the level of

painresponseduringheelprickamongnewbornatNICU,GovernmentRajajiHospital,Madurai with their selected Baselinevariables.

Thestudy assumptionswere

1. Newbornwill havevaryinglevel ofpainresponseduring heelprick
2. The warm saline water application will reduce the level of pain responseduringheel prick.

The conceptual model in this study was based on Roy's adaptation theorywhichfocusonadaptationtophysicalenvironment.QuantitativeEvaluativeapproach

-True experimental research design was used, 60 samples (30 samples for interventiongroupand30samplesforcontrolgroup)wereselectedby probability(Simplerandom

- Lottery method) sampling and assessed through Neonatal Infant Pain Scale. Aftertesting the validity and reliability of the tool, a pilot study was conducted on 10 nonstudy subjects undergone heel prick at NICU, Government Rajaji hospital, Madurai tofind out the feasibility and practicability from 20.02.2019 to 24.02.2019. The mainstudywasstartedfrom18.03.2019to10.04.2019.Theinvestigatorappliedwarmsalinewater(40^0C)gauzepadfornewborn duringheelprickfor2minutesinintervention group and routine care given to control group. During heel prick the painwas assessed by Neonatal infant pain scale. Based on the objectivesandhypothesisthe datagathered was analyzed byusingboth descriptiveand inferentialstatistics.

Thedatacollectiontoolconsistedofthreeparts.
Thetool forthestudyis consistsof twosections.

SectionI:Baselinevariables
SectionII:Neonatalinfantpainscale

Section I :Base line variables:
Age of the baby , gender , weight of the baby,mode of delivery, gestational week, APGAR score at 5min, mode of feeding,length of hospitalization, baby admitted level, time of last feed, position of thebaby

SectionII –Neonatalinfantpainscale
The neonatal infant pain scale is a behavioural scale and can be utilized withboth full term and pre term infants. It is composed of six indicators. Each behavoiuralindicator is scored with 0 or 1 except cry.Total pain score ranges from 0-7. The score0-2 forno pain– mild pain3-4 formoderate painand 5 -7 forsevere pain.

The content validity of the tool was validated by five experts,professor fromNICU and pediatric medicine, Government Rajaji Hospital, Madurai and three inpediatric Nursingexperts.

Majorfindingsofthe studywere
Thestudy findingsaresummarizedbelow.
Thedistributionofthebaselinevariablesofthestudysubjectsininterventiongroupshowsthat21(70.00%)werehadagebetween1-7days,16(53.33%)werefemales,13(43.33%)were had weightbetween 2.5-3kg,15(50.00%)weredeliveredbycaesareansection,11(36.67%)weredeliveredat39-40weeks,22(73.33%) werehad APGAR score at 5 min between7-10 scores, 20 (66.67%) wereadmitted in Level I, 22 (73.33%) were haddirect breast feeding, 11 (36.67%) werehadlastfeedbetween30minute-1hour,16(53.33%)werehadhistoryofhospitalization between 1-3 daysand 24 (80.00%)were in lying positionduring heelprick.

In control group 20 (66.7 %) were agehadbetween 1-7 days, 15 (50%) weremales,12(40.00%)werehadweightbetween3-3.5kg,16(53.34%)weredelivered bycaesareansection,13 (43.34%) were deliveredat 39-40weeks,23(76.67%)werehadAPGARScoreat5minbetween7-10scores,23(76.67%)admitted inLevelI,23(76.67%)were haddirect breast feeding, 10 (33.34%)were had last feed between 15 minutes-30 minutes, 19 (63.33%) were had historyof hospitalizationbetween 1-3 days and22(73.33%) werein lyingposition

The present study results reveals that, in post test 18 (60.00%) were had no painto mild pain response, in control group 15 (50.00%) were had moderate level ofpainresponse.

There is a significant association between the level of pain response and Directbreastfeeding,Timeoflastfeed,Positionofbabyduringheelprickismother'slap position in intervention group, whereas in control group female gender, Timeof last feedless than15 minutes, Positionof the baby during heelprick ismother'slap position.

It is statistically evidenced that warm saline water application was more effectiveinreducingthe pain duringheel prick

Conclusion:-

Thefollowing conclusions weredrawn from the study

Findings of this study revealed that warm saline water application was reducethe level of pain response during heel prick among newborn. So that this warmsaline water application can be used during heel prick in order to alleviate thepainleveland also promote thecomfortof thechildren.

There was an association between the levelofpainresponseduring heelprickamongnewborn with their selected baseline variables.

Implicationsofthestudy

1. Newborns are more sensitive to pain than adults and are more susceptible tothelong-termcomplicationsofpain.Achallengingissueistherealmofneonatalcare (pain managementprocedures).
2. Nursesare thekey personsof the Health team,who playsa major role inhealth promotion and maintenance. The main focus of nursing practice is toreducethemorbidityandmortalityrateand to improvethe qualityof life.

ImplicationforNursingPractice

1. The findings of the study support that Warm saline water applications is verysafe, cost effective method to reduce the level of pain among newborn duringheelprick
2. The study findings helps the nursing personnel to haveknowledge onusesofWarm saline water application and its physiology and include it as the part ofnursingintervention in themanagement of pain.
3. Warm saline water application can be easily follow by the staff nurses duringheelprick invarious formsin varioustypes ofInvasiveProcedure

ImplicationforNursingEducation

1. Nursing students to have knowledge, desirable attitude and skills about Warmsaline water application techniques and its benefits and it is encouraged byNurseeducator.
2. Nurse educatormotivate the nursing studentstolearn andpracticeWarmsaline water application in all health care settings among newborn during heelprick
3. Nursingstudentscanapplytheneonatalinfantpainscaleinvariousinvasiveprocedures

ImplicationinNursingResearch

1. Theresearchercanencouragetheotherresearchertousehydrotherapyalongwithpharmacological management.
2. Thisstudycanbebaselineforfurtherstudiestobuilduponandmotivateotherinvestigatorsto conduct further studiesamongnewborn.

ImplicationforNursingAdministration

1. Continuingnursingeducationandin-serviceeducationcanbeplannedbynurseadministratorsalsoaidinformulatingprotocolstopracticingwarmsalinewater applicationamongnewborn.
2. Appropriateandfeasibleorganizationalinterventionlikehealtheducation,domiciliary care services and health promotion activities will plan for warmsalinewater applicationbynursingadministrators.
3. The nurse administrator should organize activities to explain and train thenurses about their role in decreasing the level of pain and its complicationsamong newborn with the help of complementary therapy (e.g) Warm salinewaterapplication.

Recommendations:-

1. Asimilarstudycan bereplicatedwithlargersamplefor generalization.

2. Asimilarstudycan beconducted invarious settingslikeNICU.
3. The effectiveness of warm saline water application can be tested for otherinvasiveprocedures.
4. Hydrotherapywill beused bytheresearcher in differentnatureof pain.

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