International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

Denouement on Hydrocephalus among Pediatric Age Groups -A Clinical Pharmacist Role

Dr. Devarapalli Lakshmi Chandrika[1*], Dr. Chandolu Suvarna Rani[1], Dr. Devalaraju Krishna Chaithanya[1], Dr. Panem Venkata Sai Praveena[1], Dr.D. Rispa Pharm D, MBA [2].

1. Pharm D Intern, Department of Pharmacy practice, Hindu College of Pharmacy, Guntur, Andhra Pradesh, India.

2. Assistant Professor, Department of Pharmacy Practice, Hindu College of Pharmacy, Guntur, Andhra Pradesh, India.

Date of Submission: 01-08-2021 Date of Acceptance: 18-08-2021

ABSTRACT :

AIM:The role of diuretic therapy in treating hydrocephalus in pediatric age groups.The aim of the study is to analyze the etiological causes and supportive therapy of hydrocephalus, to create awareness among women in their gestational period.

MATERIALS AND METHODS: This is a Prospective clinical and interventional observational study.A Patient individual predecessor of 13 age groups with a clinical presentation and are willing to participate in the study are eligible for participation. Our study comprises of 26 individuals. Those patients who meet the study criteria will be enrolled in to the study. Relevant data such as demographics details, risk factors, comorbid conditions, past medical history, drug name, dose, route, frequency, duration of therapy, total pills per day was collected from profile form of the patient and by patient interview. Complete follow up should be done within 6 months by interviewing during their review or by phone calls.

STATISTICAL CONSIDERATION: All the raw data was collected, entered in excel sheet 2019 in windows 10 version, thestatistical analysis is carried out using the R programming software 4.0.0 by an appropriatestatistical methodpaired T test for knowing the significant p-value <0.005(confidence interval 95%).

RESULTS: Among 26 patients, each individual score are comparedwith before treatment and after treatment i.e. 35.45±2.97 with before treatment i.e. During therapy the head size was improved to 34.51±3.26. which is found to be statistically significant ($p<0.05$). After the treatment there is a significant difference in terms of head size. The patient condition was improved by the treatment.

CONCLUSION: Denouement of Hydrocephalus on pediatric age groups aimed at effectiveness of supportive therapy on pediatric HC patients. This study has been undergone to evaluate the efficacy of supportive therapy in treating pediatric Hydrocephalus as it plays an important role in deciding the fate of children from poverty level, which is a socio economical barrier as of delayed shunt process to increase the shelf life of individual.

KEYWORDS:HC, Pediatric,Supportive therapy, gestational period,Patient interview, Head size.

I. INTRODUCTION

A brain is an organ that serves as the center of the nervous system in all vertebrate and most invertebrate animals. Brain anatomy comprises of different parts, the forebrain is termed to be the largest region in the brain, which is further divided into the cerebral hemispheres, the corpus callosum, thalamus, hypothalamus, and hippocampus. Below the forebrain its hindbrain, it consists of the cerebellum, pons, and medulla."Hydrocephalus is defined as active distension of the ventricular system of the brain resulting from inadequate passage of CSF from its point of production within the cerebral ventricles to its point of absorption into the systemic circulation. It is a phenomenal condition where excess of cerebrospinal fluid (CSF) accumulates within the ventricular system of the brain leading to increased intracranial pressure (ICP) and related consequences. This can apparently result from various causes that can affect a fetus, infant, child or adult. Numerous definitions of hydrocephalus have been proposed. Summarily, it can be described as an imbalance between production and absorption of CSF.[1]Over production of CSF can

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

also be a cause of hydrocephalus due to choroid plexus tumors, but these are rare (tumors) in clinical practice. "It's thought hydrocephalus present at birth may be the result of a brain defect restricting the flow of cerebrospinal fluid (CSF). Hydrocephalus that develops in adults and children is often caused by an illness or injury that affects thebrain.

HISTORY:

Hydrocephalus has been unrecognized for centuries. But Hippocrates in (5th century B.C.), the father of medicine, is thought to be the first physician to attempt and document the treatment of hydrocephalus. Accumulation of fluid in various intracranial compartments was recognized by Hippocrates further description and delineation of thiscondition can be found in the works of Galen. Dandy and Black fan (1913) further contributed by creating experimental models of hydrocephalus which led to the classification and differentiation between the non-communicating (obstructive) and communicating forms with distinct possible treatment strategies[2]. The history of the treatment of hydrocephalus has been described in detail by John Scarf in 1963. Walter Dandy proposed 3rd ventriculostomy in 1922 for obstructive variety. A flood of operative techniques for the diversion of CSF have come into vogue since 1939.Meanwhile, advances in optics and endoscopes werepopularized the endoscopic 3rd ventriculostomy asoriginally described byMiter.

INDIAN SCENARIO:

Large heads were generally ignored in the past. Proving the fact that excessive fluid inside the head was the cause of hydrocephalus and its effects used to be a challenge. Though plain X-rays were indicative, they were not necessarily confirmatory. Here comes, the introduction of computed tomography (CT) in 1980shas rapidly advanced the detection and treatment. Indian economy had put several restraints in the usage of western shunts. Surgeons resorted to valve less infant feeding tubes as shunts. However, they were found to be useful particularly in post-infective hydrocephalus. They were not only economical but also effective in situations where CSF protein was high. development of economical Indian shunts which have now became popular even outside India. In the last decade, endoscopic third ventriculostomy (ETV) has become a popular surgical procedure for hydrocephalus. Over the years, improvement in social status, awareness, better nutrition and betterperinatal care have resulted in reduction in major anomalies and associated hydrocephalus.

CLASSIFICATION:

Based on the results with the present CT and magnetic resonance imaging (MRI) techniques, it is possible to localize with accuracy the exact site of blockage of flow to CSF. Hence, a more helpful classification is as follows: The hydrocephalus may be due to: Overproduction of CSF (a rareentity). Obstructive, where [obstruction to the flow of CSF in the lateral ventricles, foramen of Monroe, 3rd ventricle,aqueduct of Sylvius,4th ventricle orsubarachnoidspaces],Absorptiondefect.

SIGNS, SYMPTOMS AND RISK FACTORSOF HYDROCEPHALUS:

The symptoms of hydrocephalus tend to vary greatly from person to person, age, disease progression, and individual differences in tolerance to thecondition.For examples Infants and young children are more susceptible to symptoms from increased intracranial pressure like vomiting Infants: scalpveins downward deviation of eyes (also called "sunsetting)children, older children and adults may experience different symptoms because their skulls cannot expand to accommodate the buildup of CSF. Symptoms may include Headache,Vomiting, Nausea, Blurred or doublevision, sun setting of theeyes,Problems withbalance, Poor, coordination, Lethargy,Drowsiness. The common risk factors of hydrocephalus include: [3][4] ,Lack of prenatalcare, Maternaldiabetes,Maternal chronichypertension.Maternal hypertension during gestation.Life style issues & malnourished duringpregnancy.

CEREBRO SPINAL FLUID PATHWAY [FORMATION, CIRCULATION, ABSORPTION, RANGE]:

Hydrocephalus is an active distension of the ventricular system of the brain resulting in the inadequate passage of CSF from its point of production within the cerebral ventricles to its point of absorption into the systemic circulation. It is generally assumed that the main production sites of CSF are the choroid plexuses (contributing 70-80%) where the filtration across the endothelial wall of the capillaries and the secretion through choroidal epithelium occur [5]. Formation of CSF is assumed to be an active process independent of intracranial pressure and therefore an obstruction of the CSF pathways will lead to hydrocephalus[6].Normal route of CSF from

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

production to clearance is the following: From the choroid plexus, the CSF flows to the lateral ventricle, then to the interventricular foramen of Monroe, the third ventricle, the cerebral aqueduct of Sylvius, the fourth ventriclethe two lateral foramina of Luschka and one medial foramen of Magendie, the subarachnoid space, the arachnoidgranulations, the Dural sinus, and finally into the venous drainage.flow of CSF results from the pulsatile pumping action of the choroid plexuses that is generated by the filling and draining of choroid plexuses[7] . Each pulse within the choroid plexus will force the CSF out of the ventricles into the SAS. Additionally, there is some flow of the CSF into the spinal SAS, likely with a lower intensity,[8]Arachnoid villi inside the Dural venous sinuses have been generally thought to be the main site of CSF absorption. It is believed that CSF is passively absorbed from the cranial SAS to the cranial venous blood by means of a hydrostatic gradient[9]. Initially the villi on the arachnoid granulation were described as an open tubular system projecting from the granulation tissue into the venous sinus [10]. The ultrastructural studies have not been consistent in support of these pressure sensitive openings through the arachnoid villi, Ranges of CSF:Normal CSF production is 0.20-0.35 mL/min; most CSF is produced by the choroid plexus, which is located within the ventricular system, mainly the lateral and fourth ventricles. The capacity of the lateral and third ventricles in a healthy person is 20 ml. Total volume of CSF in an adult is 120 ml.We test three theories: the ventricular wall is impermeable to CSF;[11] ventricular CSF seeps into the parenchyma, from which it is efficientlyabsorbed. [11]ventricular CSF seeps into the parenchyma but is absorbed inefficiently. While we look into hypothesis they are 3 main categories, circulation theory is widely accepted as a hypothesis for the development of hydrocephalus, there is a lack of adequate proof in clinical situations and in experimental settings. Circulatory theory,Osmatic gradient,Macromolecular clearanceare listed major among them.

Summary Andinterlink Between The Three Theories**:**

Hydrocephalus is a complex condition resulting from a wide variety of different disorders.Circulation theory although widely accepted to be representative of how hydrocephalus develops does not have adequate proof either in clinical situations or in experimental setting.There is significant evidence that osmotic gradients are responsible for water content of the ventricles of the brain just as they are in other water permeable organs in thebody, any disorder that results in excess macromolecules in the ventricular fluid will change the osmotic gradient and result inhydrocephalus. Alternatively, we can view hydrocephalus as a disorder of macromolecular clearance Evidence points to a paravascular or lymphatic clearance of these macromolecules out of the ventricles and the brain into the venous system. Although there are clearly some gaps in this pathophysiological construct as well, this seems to have considerably more support.

DRUGS DISCOURSE:

Isosorbide, a dihydric alcohol derived from sorbitol that functions as an osmotic diuretic, is the best studied in hydrocephalus. Although isosorbide allowed delay of the surgical closure, there was no difference in need for shunting; furthermore, side effects led the authors to conclude that it has no role in management of these children [12]

Glycerol, a trivalent sugar alcohol, was known as a diuretic agent since the early 1900s [13]. As an oral osmotic agent, it was shown to reduce intracranial pressure in adults with brain tumors and was suggested as a possible agent for managing hydrocephalus[14]. However, a few small, uncontrolled trials did not support its use. Although used widely for temporary management of elevated ICP in situations of brain swelling, mannitol has seldom been used except in adults with acute hydrocephalus caused by intracerebral hemorrhage [15]

FUROSIMIDE:The usual initial dose of oral Lasix in pediatric patients is 2 mg/kg body weight, given as a single dose. If the diuretic response is not satisfactory after the initial dose, dosage may be increased by 1 or 2 mg/kg no sooner than 6 to 8 hours after the previous dose. Doses greater than 6 mg/kg body weight are not recommended. For maintenance therapy in pediatric patients, the dose should be adjusted to the minimum effectivelevel.

ACETAZOLAMIDE:The suggested total daily dose is 8 to 30 mg per kg in divided doses.

MANNITOL:Dosage varies with the complications associated with comorbid conditions

a.Reduction of Intracranial Pressure and Brain Mass: Pediatric patients 1 to 2 g/kg body weight or 30 to 60 g/m2 body surface area over a period of 30 to 60 minutes. In small or debilitated patients, a

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

dose of 500 mg/kg may be sufficientb. Reduction of Intraocular Pressure: pediatric patients 1 to 2 g/kg body weight or 30 to 60 g/m2 body surface area over a period of 30 to 60 minutes, in small or debilitated patients, a dose of 500 mg/kg may be sufficient

FUROSEMIDE/ACETAZOLAMIDE COMBINATION: Furosemide is a diuretic agent that inhibits the Na–K–2Cl symporter located in the distal tubules of kidney. Vinas mentioned use of furosemide in management of a hydrocephalic child[16]. Medical therapy with acetazolamide 100 mg/kg/day and furosemide1 mg/kg/daycanbeaneffectivealternativetoshuntingby haltingprogressionof hydrocephalus until such time as sutures can become fibroses and spontaneous arrest can occur.

II. MATERIALS AND METHODS:

This is a prospective clinical and interventional observational study conducted amongst the patients visiting Department pediatrics of Guntur Government Hospital, Guntur, St. Joseph Hospital, Guntur, carried out for a period of 6 months from July2019 to January 2020. The inclusion criteria and exclusion criteria were categorized as follows.

INCLUSION CRITERIA:Patient predecessor of 13 age groups are willing to participate in the study Patients with comorbid conditions such as viral encephalitis, Tubercular meningitis, Multiple tarlov cysts (Obstructive Hydrocephalus).Patients who are with ongoing diuretictherapy, Patients who comply to participate in the study with the returned informedconsent.

EXCLUSION CRITERIA**:**Patients who are not willing to participate in thestudy, Patients with age more than12, Admitted to wards other than pediatricsdepartment. Patients who don ‘t receive diuretictherapy.

TRADITIONAL METHODS FOR MEASUREMENT:Merely the size of hydrocephalus plays an important, role in calculating the intensity of disease, Size of hydrocephalus is measured using the measuring tape or conventional method of cotton thread.

STATISTICAL PROCEDURES:There are many statistical methods available for analyzing the data. out of them Paired T test is used to analysis the before and after treatment. The programming available for the employment of the statistical method are many, we used R programming,as it has immense benefits than the other programming ‘s present for the data analysis. It provides a suite for performing exploratory data analysis.

SOURCE OF THE DATA:All the relevant and necessary data will be collected from Treatmentchart,Interviewing the patient caretaker,collecting data from pediatrician, and nursingstaff,any other relevantsources

III. RESULTS AND ANALYSIS:

We have conducted an analysis among the patients with hydrocephalus and asked for different categories related to both hydrocephalus and socio-economic factors. we have surveyed a data among 26 patients and got the results as follows –

TABLE 1 – Gender Differentiation

MALE	15	58%
FEMALE	11	42%

As we had conducted survey among the patients regarding the ratio of affected people, among them we had analyzed that 58% males and 42% females, hence male child is more prone than the female child.

TABLE 2 – CONSIDERING WEIGHTS

WEIGHTS	2.5	3	3.2	3.5	3.7	3.8	3.9	4	4.2	4.5	4.7	5
NO. OFPTS	1	2	6	4	2	2	3	2	1	1	1	1

In the survey conducted on hydrocephalic patients about the mostly affected weight of the child, the above table values show the infants with weight ranging from 3.6-4.7 are mostly affected children weight.

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

TABLE 3: AGE DISTRIBUTION OF PATIENTS

Age	4m	5m	6m	7m	8m	9m	1y	2y	3y	4y	5y	7y	10y	11y
No of patients	2	3	3	2	3	3	2	2	1	1	1	1	1	1

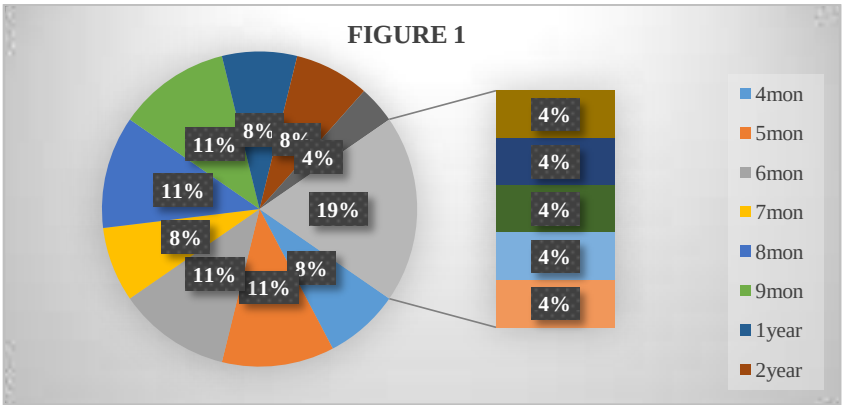

FIGURE 1: PIE DIAGRAM ILLUSTRATING AGE DISTRIBUTION AMONG THE PATIENT

From Figure 1, the survey held among the different age groups with hydrocephalus, fromthe above pie diagram. we found that people below one year and a year are mostly susceptible indevelopinghydrocephalus

TABLE 4: HEAD SIZE DIFFERENTATIONBEFORE TREATMENT

HEAD SIZE	30	32	32.62	33	34	35	35	35.26	37	38	38.05	39	40	41
NO.OF PTS	1	3	1	1	2	1	2	1	2	3	1	1	2	1

From the Table 4 analysis, all the head sizes of data collected among the hydrocephalus patients it is found that head size lying between 33.5inches – 37 inches children has more incidence.

TABLE 5: HEAD SIZE DIFFERENTATION AFTER TREATMENT

HEAD SIZE	28	30	30.45	31.4	32	33	33.64	34	34.25	35	36	36.5	37.7	38	38.5	39	40
NO. OF PTS	1	2	1	1	2	4	2	2	1	1	2	1	2	2	1	1	1

From Table 5 the analysis, allthe head sizes of the data collected among thehydrocephalus patients it is found that head size lying between 31.9 inches– 35.8 inches ‘childrenhasmoreincidence.
The following categories are observed from analysis of the survey data from underlying comorbid conditions and socio-economic factors: Incidence of cases and Differential analysis of complications.

INCIDENCE OF CASES:

TABLE 6 - MATERNAL AETIOLOGIC CAUSE

MALNOURISHED	19
COMPLICATIONS	9
LIFESTYLE	12

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

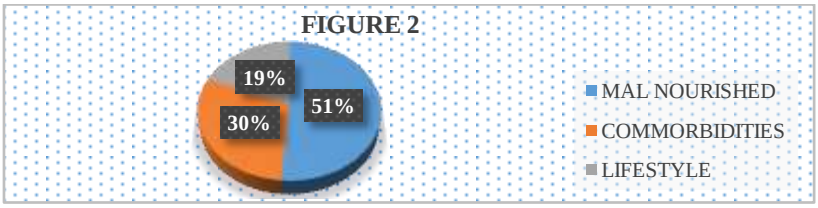

FIGURE 2 – PIE DIAGRAM DEPICTS MATERNAL ETIOLOGICAL CAUSES

From the above pictorial presentation of all the data collected during the survey, mostly we found out patients are dealing with malnourished lifestyle issues, complications during pregnancy, among them 47% malnourished, 30%lifestyle, 23%complications during pregnancy. so, people who have mal eating habits during pregnancy and maternal complications can lead to hydrocephalus of children.

DIFFERENTIAL ANALYSIS OFCOMPLICATIONS:

TABLE 7 - COMORBID CONDITIONS DURING PREGNANCY

HYPERTENSION	9
DIABETES	11
THYROID	6

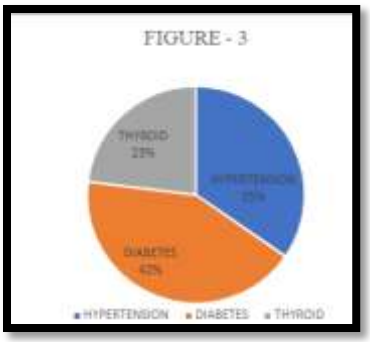

FIGURE3 PIECHART DEPECITS DIFFERENTIAL ANALYSIS OF COMPLICATIONS

From the survey regarding the lifestyle complications during the pregnancy has been enlisted and found to be 42% gestational diabetes, 35% hypertension and 23% thyroid. Hence it is stated that diabetes and hypertension during pregnancy aids the growth of hydrocephalus in infants.

DRUGS	DOSAGE	NO. OF PATIENTS ADMINISTERED	HEAD SIZE CHANGESAFTER ADMINISTRATION
Acetazolamide	100mg/kg/day bwt	3	1.5cm
Furosemide	2mg/kg bwt	4	1.32 cm
Acetazolamide + Furosemide	100mg+2mg /kg	4	1.67 cm

TABLE 8 – DRUG ADMINISTRATION

From Table 8 all the data had been recorded and differentiated to each other drugs efficiency by means of calculating the size difference of head for each individual and after analyzing before and after treatment acetazolamide with furosemide combination has more impact in treatinghydrocephalic patients than administered in 2 different single doses.so out of these above

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

options combination therapy tends to have more effect and likewise have lesser side effects when administered in combination therapy. When we move in to the main analysis of the hydrocephalus, which is analyzing the data of headsize on treatment to without treatment. As the headsize is a marked to measure the rate of hydrocephalus growth. The head size of a healthy individual is measured by using head circumference. The distance around the baby's head. The average newborn's head measures 13 3/4 in (35 cm) Generally, a newborn's head is about half the baby's body length in cm plus 10 cm. So, a baby that is 18 inches long would be 45.7 centimeters (18 x 2.54) [1inch -2.54cms] His or her head would be about 32.9 cm or a little under 13inches.There are many statistical methods available for analyzing the data. out of them Paired T test is used to analysis the before and after treatment. The programming available for the employment of the statistical method are many, we used R programming,as it has immense benefits than the other programming ‘s present for the data analysis. It provides a suite for performing exploratory data analysis.All the raw data was collected, entered in excel sheet 2019 in windows 10 version, the statistical analysis was done in R programming software 4.0.0 by an appropriate statistical method paired T test for knowing the significant p-value <0.005(confidence interval 95%).

SUPPOTIVE THERAPY	Mean ± SD	p VALUE
BEFORE	35.45±2.97	0.003
AFTER	34.51±3.26	

TABLE 9 PAIRED T TEST

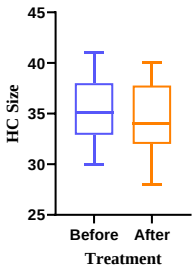

FIGURE 4 ABOVE BAR GRAPH DETERMINES BEFORE AND AFTER TREATMENT

From the above graph Figure 4among 26 patients that are involved in the treatment, when compared to score with before treatment and after treatment i.e. **35.45±2.97** with before treatment i.e. During therapy the head size was improved to **34.51±3.26**. i.e. (head size is eventually decreased when compared to initial condition), the p value obtained after statistical analysis is **p value 0.003**, Hence,the p value is less than 0.05 it rejects the null hypothesis and a significant difference between the before and after treatment.which is found to be statistically significant p<0.05 (confidence interval 95%).After the treatment there is a significant difference in terms of head size. The patient condition was improved by the treatment.

IV. DISCUSSION:

Denouement of hydrocephalus among pediatric age groups dealt with some external and internal factors during the span of project data collection. They are classified into the following – Evidence based treatment, Underlying comorbid conditions, Socio economical factor.

EVIDENCE BASED TREATMENT- Drugs which are given to the patients (infants, children) in our hospital to treat the following aspectsin case of hydrocephalus condition the first choice of drug is Acetazolamide, furosemide. Likewise, patients with seizures/epilepsy associated with hydrocephalus in such condition the first line of drug is phenytoin. (NOTE–drug strength varies with the individual based on general dosage calculations i.e., weight, age, height considerations) Furosemide:According to Stephen nelson etal, [17] He stated that Acetazolamide (ACZ) and furosemide (FUR) treat normal pressure hydrocephalus in neonates, children. Both are diuretics that also appear to decrease secretion of CSF at the level of the choroid plexus. ACZ can be used alone or in conjunction with FUR. The

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

combination enhances efficacy of ACZ in decreasing CSF secretion by the choroid plexus. If ACZ is used alone, it appears to lower risk of nephron calcinosis significantly.Hence according to this article, we prove that evidence-based medication is given in our case to treat the normal pressure hydrocephalus.Phenytoin**:** According to the Andreas etal, [18]he says that the condition seizures, epilepsy during hydrocephalus are occurred, hence this statement meets with ourcriteria and also stated that they are beentreated with phenytoin. The seizures/ epilepsy in our case are also treated with phenytoin.

COMMORBID CONDITIONS–These deal with the comorbid conditions that occur during the pregnancy,they are ruled out in the following– Gestational Diabetes, Hypertension, Thyroid.These conditions are placed according to the rate of incidence they occurred in our cases. Gestational Diabetes –The rate of incidence is high when compared to the other factors that are ruled out, it is first major condition that causes hydrocephalus in infantsAccording to journal of biological science, [19]maternal diabetes is associated with increased risk of offsprings such as growth defects,congenital abnormal. Maternal diabetes effect on blood brain barrier permeability in infants that could cause larger amount of CSF production, these effects could lead to brain disorder such as hydrocephalus, as per Lawrence Jacob etal, [20]Diabetes concurrent with normal pressure hydrocephalus may result from involvement of hypothalamic and brainstem autonomic structures by the expanding ventricles during the evolution of hydrocephalus.Hence this provesthat gestational diabetes leads to hydrocephalus in some individuals due to high levels of glucose leads to malformation,in addition to the oxidative stress.Hypertension–This is second major comorbid condition that indirectly cause hydrocephalus, and many articles are elucidating the reasons for eclampsia or maternal pregnancy that lead to subset effect on hydrocephalus resulting in congenital condition, one of the articles by review of obstetric and perinatal outcome in hypertension Sreelatha S, Kamala,[21]says that Decreased blood flow to the placenta. If the placenta doesn't get enough blood, your baby might receive less oxygen andfewer nutrients. This can lead to slow growth (intrauterine growth restriction), low birth weight or prematurebirth.In our case study when we were observed that 2/3rd of mother was suffered with hypertension during pregnancy, it may be one cause of congenital hydrocephalus in children. By these we concluded that hypertension in gestation women causes hydrocephalus in children.Thyroid– This is another leading cause for hydrocephalus, that occurs due to abnormality in thyroid hormone during pregnancy. As per Sreelatha etal,[22]the newborn rat may be compared with a human fetus in the second trimester of pregnancy, and the newborn human baby to a 6-10-day old rat. The hypothyroid brain presents many structural defects, Increases in cell density in the cerebral cortex, due to reduction of the neuropil.

SOCIO ECONOMICALFACTORS- This aspect is further divided into two subtypes they are

ENVIORNMENTAL FACTORS–The environmental factors are those which we do in our daily routine which has a great impact on growth of fetus during the mother is carrying, they are listed out in different aspect and at different trimesters of pregnancy.Aristoteles V Kalyvas et al.[23]studies that investigated environmental risk factors concerning the mother-either during gestation or pre-gestationallywere included, theyareMaternal medication or alcohol use duringgestation;lifestyle modifiable maternal pathologies such as obesity, diabetes, or hypertension; pregnancy induced hypertension., pre- eclampsia & eclampsia, single or multiparous gestation maternal, tobacco and drug use, infection and trauma during gestation, trauma or sexually transmitted disease at parturition, and other family members with hydrocephalus, advanced maternal risk & a low socioeconomic status were identified as significant maternal environmental risk factors for CHdevelopment.Maternal infections and trauma to the mother during pregnancy have also been highlighted as potential mother-related risk factors forCH.

MAL NOURISHMENT– The main aspect regarding socio-economic factors that is malnourished mother during her time of pregnancy that leads to abnormal growth of fetus and that's aided to cause hydrocephalus congenitally.On basic when mother is malnourished the fetus do not receive all the required nutrients and essential elements required for their overall mental and physical development of body in such cases the fetus experience tubercular meningitis which is a general precursor for infantile normal pressurehydrocephalus.Popitt[24] states that maternal undernutrition is commonly cited as a cause for retarded fetal growth, malformations of the central nervous system such as spina bifida and hydrocephalus, andprematurity.

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4 July-Aug 2021, pp: 1305-1314 www.ijprajournal.com ISSN: 2249-7781

V. CONCLUSION:

Denouement of Hydrocephalus of pediatric age groups aimed at effectiveness of supportive therapy on pediatric HC patients, maternal gestational comorbid conditions like Diabetes, hypertension (pre- eclampsia), Thyroid and socio- economic factors. Socio- economic factors are termed as malnutrition and lifestyle modifications.Our main motto is to create awareness for mother about life style modifications. In our study maternal gestational complications like Diabetes mellitus, Hypertension (pre- eclampsia) and thyroid are observed and the incidence rate is high for Gestational diabetes when compared to other comorbid conditions.This study has been undergone to evaluate the efficacy of supportive therapy in treating pediatric Hydrocephalus as it plays an important role in deciding the fate of children from poverty level, which is a socio economical barrier as ofdelayed shuntprocess to increase the shelf life of individual.In our study we dealt with supportive therapy which includes administration of diuretics such as carbonic anhydrase inhibitors and loop diuretics as they are known to show best therapeutic efficacy in treatingHydrocephalus.Pediatric head size is majorly considered, as it is a marked sign for Hydrocephalus condition so such patients undergo diuretic therapy for a span of one week until shunt process is done, based on data collected which include the head size of before and after supportive therapy, the statistical analysis were done and observed p value is 0.003 ($P<0.05$) there is a visible difference of head size before and after administration of supportive treatment As this study carries the importance of awareness dealing with Hydrocephalus evolved through maternal complications during gestation . Such elucidation of awareness shows a remarkable influence on both the mortality and morbidity rate. In our study the morbidity rate hasincreased. Hence the purpose of the study meets the benefit of mankind.

REFERENCES

[1] N. D. Thompson D. Hydrocephalus and Shunts. In: Moore AJ, "Principles and practice. Springer: Specialist Surgery Series Neurosurgery; 2005.," Google schloar.

[2] W. a. B. K. Dandy, "An Experimental, Clinical and Pathological Study.," American Journal of Diseases of Children, 8, 406-482..

[3] T. V. N. A. R. A. D. P. J. Z. M Van Landingham 1, "Risk factors of congenital hydrocephalus: a 10 year retrospective study," Pub med.

[4] M.-L. H. R. 2. J. W. 2. M. J. 3. M. M. 2. Tina Noergaard Munch 1, "Risk factors for congenital hydrocephalus: a nationwide, register-based, cohort study," pubmed, .

[5] E. A. B. Jr, "Choroid plexus and arterial pulsation of cerebrospinal fluid; demonstration of the choroid plexuses as a cerebrospinal fluid pump," AMA Arch Neurol Psychiatry, february 1955.

[6] K. W. a. M. B. S. N. Y. Hugh Davson, The physiology and pathophysiology of the cerebrospinal fluid, New york, leaving stone, 1988.

[7] D. C. G., "Observations on the circulation of the cerebrospinal fluid," pubmed, google schloar, Acta Radiologica, 1 march 1966.

[8] H. L. Rekate, "The definition and classification of hydrocephalus: a personal recommendation to stimulate debate. Cerebrospinal Fluid," pubmed, 22 january 2008.

[9] V. F. K WELCH, "The cerebrospinal fluid valves," pubmed,NCBI.

[10] a. H. W. Louis B. Flexner, "The rate of formation of cerebrospinal fluid in etherized cats," American Journal of Physiology, 31 august 1932.

[11] D. N. Levine, "The pathogenesis of normal pressure hydrocephalus: a theoretical analysis," Pubmed, September 1999.

[12] M. M. E. G. M. N. K. M. Gregory S. Liptak M.D., "Isosorbide in the medical management of hydrocephalus in children with myelodysplasia," wiley online library, april 1992.

[13] A. J. C. a. A. J. Victor Johnson, "Studies on the physiological action of glycerol on the animal organism," American Journal of physiology, 23 february 1933.

[14] G. C. M. B. G. M. a. M. V. M.D., "Oral Glycerol for the Reduction of Intracranial Pressure," Journal of neurosurgery, april 1964.

[15] D. F. E. A. R. Z. M N Diringer, "Hydrocephalus-a previously unrecognized predictor of poor outcome from supratentorial intracerebral hemorrhage.," pubmed, july 1998.

[16] D. L. D. C. Marc R. Del Bigio, "Nonsurgical therapy for hydrocephalus: a comprehensive and critical review," pubmed, 5 February 2016.

[17] s. nelson, "What is the mechanism of action for medications used in the treatment of hydrocephalus?," medline, medscape, june 2014.
[18] A. Eleftheriou, "Idiopathic normal pressure hydrocephalus presenting with epileptic seizure as a cardinal symptom," elsevier, november 2019.
[19] L.jacob, "Diabetes mellitus in normal pressure hydrocephalus.," April 1977.
[20] J. K. a. Z. G. M. Tehranipour, "Maternal Diabetes Induced Hydrocephaly in Newborn Rats," 2009.
[21] K. R. S. N. S. A. B. A. Sreelatha S, "A clinical review of obstetric and perinatal outcome in hypertension," Endocrinology & Metabolism International Journal, 10 july 2018.
[22] D. A. E. J A NOONAN, "A. Complications of ventriculovenous shunts for control of hydrocephalus," pubmed, 11 july 1963.
[23] D. W. B. I. D. S. G. F. W. B. C. J. W. &. G. J. Matthew J. McGirt, "Adjustable vs set-pressure valves decrease the risk of proximal shunt obstruction in the treatment of pediatric hydrocephalus," 16 november 2006.
[24] S. D. Poppitt, "Nutrition of pregnant mothers in developing countries," springer.