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COMPARATIVE EVALUATION OF RATIONAL USE OF VANCOMYCIN IN PEDIATRIC IN CHILDREN HOSPITAL AND INSTITUTE OF CHILD HEALTH (CH & ICH), LAHORE

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Abstract

The aim of this study is to evaluate the rational use of vancomycin in different age groups of pediatrics (neonates, infant, young child, child and adolescent) in children hospital and Institute of Child Health, Lahore. The data of 50 patients who have been administered vancomycin through intravenous route was collected from different wards including neurology, cardiology, gastroenterology and Medical unit. Prescribed dose of vancomycin was compared with actual dose of vancomycin i.e. 15mg/kg/dose according to weight of individual patients among pediatrics on the basis of their ages. Data was categorized according to pediatric age that includes neonates (0-30 days) 4%, infants (1 month- 2years) 38%, young child (2-6 years) 36%, child (2-12 years) 16%, adolescent (12-18 years) 6%. Both prescribed dose and desired calculated dose were comparatively analyzed. 50% neonates, 73.6% infants, 50% child and 0% adolescents were prescribed correct dose of vancomycin.

Keywords: Vancomycin, Pediatrics, neonates, adolescents, Prescribed dose.

Introduction

Vancomycin became available for clinical use >50 years ago. In 1952, a missionary in Borneo sent a sample of dirt to his friend Dr. E. C. Kornfield, an organic chemist at Eli Lilly. An organism isolated from that sample (Streptomyces orientalis) produces a substance (compound 05865) that was active against gram positive organisms. In-vitro experiments were initiated to determine, whether the activity of compound 05865 would be preserved. Subsequent animal experiments suggested that compound 05865 might be safe and effective in humans. However, before clinical trials were begun, the compound, dubbed "Mississippi mud" because of its brown color, needed to be purified. A switch from picric acid precipitation to passage over an ion-exchange resin was an improvement, and the resulting drug, named "vancomycin" from word "vanquish"), was made available for clinical trials.

Actions: Vancomycin binds to bacterial cell wall, resulting in bacterial cell death. It has bactericidal action against susceptible organisms. It is active against gram positive pathogens, including: Staphylococci (including methicillin resistant strains of Staphylococcus aureus), Group A beta-hemolytic streptococci, Streptococcus pneumonia, Corynebacterium, Clostridium difficile, Enterococcus faecalis, Enterococcus faecium.

Absorption: Poorly absorbed from the GIT.

Distribution: Widely distributed, some penetration (20-30%) of CSF; crosses placenta.

Metabolism and excretion: Oral doses excreted primarily in the feces. IV vancomycin eliminated almost entirely by kidneys.

Half-Life: Neonate: 6-10 hours; Children 3 months- 3 years: 4 hours; Children >3 years: 2-2.3 hours; Adults: 5-8 hours.

Indications: Treatment of potentially life-threatening when toxic anti-infectives infections less are contraindicated. Particularly useful in staphylococcal infections, including: Endocarditis, Meningitis, Osteomyelitis, Pneumonia, Septicemia, Soft-tissue infections in patients who have allergies to penicillin or its derivatives or when sensitivity testing demonstrates resistance to methicillin^[3].

Dose through IV:

Neonate less than 29 weeks corrected gestational age 15mg/kg every 24 hours, adjusted according to plasma concentration.

Neonate 29-35 weeks corrected gestational age 15mg/kg every 12 hours, adjusted according to plasma concentration.

Neonate over 35 weeks corrected gestational age 15mg/kg every 8 hours, adjusted according to plasma concentration.

Child 1 month- 18 years 15mg/kg every 8 hours (maximum daily dose 2g), adjusted according to plasma concentration^[1].

Pregnancy category: Category C

Contraindications: Contraindicated in hypersensitivity.

Adverse Reactions: Ototoxicity, nephrotoxicity, hypotension, nausea, vomiting, rashes, phlebitis, eosinophilia, back and leukopenia, neck pain, hypersensitivity reactions including Anaphylaxis, chills, fever, red man syndrome, superinfection.

Drug-drug Interactions: May cause additive ototoxicity and nephrotoxicity with other ototoxic and nephrotoxic drugs (aspirin, aminoglycosides, cyclosporine, cisplatin, loop diuretics). May enhance neuromuscular blockade from nondepolarizing neuromuscular blocking agents. Risk of histamine flush when used with general anesthetics in children^[7].

The division of pediatric age categories for the administration of drugs is largely arbitrary. The majority of drugs are administered on a weight basis (e.g. mg/kg), often until either an adult dose or an arbitrary weight ceiling (e.g.50kg) is reached. The following age groupings, with slight differences, appear to have received widespread acceptance. Premature Newborns:<38 weeks' gestational age, Term Newborns: >38 weeks' gestational age, Neonate: 0-30 days of age, Infant: 1 month-2 years, Young child: 2-6 years, Child: 6-12 years, Adolescent: 12-18 years^[2].

Materials and Methods

Collection of clinical data of patients:

The study was carried out in Children Hospital and Institute of Child Health, Lahore, a public children hospital located on Ferozepur Road, Lahore, Punjab, Pakistan. Study was carried out between July and August, 2017. Data was collected from Neurology, Cardiology, Gastroenterology and Medical wards. Data of 50 patients administered with vancomycin was taken. Following information of pediatric patients were taken: patient name, medical record (MR. #), age (in days, months and years), weight (kg), diagnosis, prescribed dose (mg as three times a day).

Results and discussion

Vancomycin restricted use antibiotic in the hospital, prescription depended upon evaluation by the antimicrobial rationalization service. This department evaluates all requests for restricted-use antimicrobials according to completed requirement forms. When the infectious disease specialist staff informed the assistant physician about partial Gram-positive blood culture results and, subsequently, the final results with complete identification of the respective antibiogram, the data and recommended antimicrobial therapy were discussed and alterations could be suggested ^[6]. The vancomycin prescription was prescribed by medical residents in their respective specialty. They were oriented by staff physicians; whose average years of qualification were five years^[5].

Vancomycin was prescribed three times daily (TDS). Its dose was calculated according to BNF for Children 2016-2017, i.e. 15mg/kg/dose TDS. Prescribed dose was analyzed by calculated dose of individual patient ^[1].

Grouping of pediatrics according to their age

Data was grouped according to age of pediatric patients age as follows: Neonates (0-30 days) 4%, Infants (1 month- 2years) 38%, Young child (2-6 years) 36%, Child (2-12 years) 16%, Adolescent (12-18 years) 6%^[2].

Calculation of Vancomycin dose according to weight:

Vancomycin dose was calculated according to weight of patient. In BNF for Children 2016-2017, usual dose of vancomycin is 15mg/kg/dose TDS (maximum daily dose 2gm)^[1].

Analysis of Rational use of Vancomycin dose:

Both the prescribed dose and calculated dose of vancomycin was compared and analyzed for individual patient. Their difference was recorded as shown in the following **Table 1--5**.

CONCLUSION

In children hospital, limited number of patients were evaluated for the determination of rational use of vancomycin. It is concluded that prescribed dose of vancomycin was correct according to desired calculated dose approximately 50% neonates, 73.6% infants, 50% child and 0% adolescents as shown in **Figure 1**.

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Table 1: Vancomycin dose in Neonates (0-30days)

Sr. #	Pt.name	MR. #	Age (Days)	Weight (kg)	Diagnosis	Prescribed dose (TDS)	Calculated dose (TDS)	Analysis
1.	Kabsha	361750	20Days	3.5kg	Ventricular Tab	50mg	15*3.5=52.5	Compliance
2.	Essa	205844	29Days	4kg	Hypocelemic fits	50mg	15*5=75	Non-Compliance

Table 2: Vancomycin dose in infants (1-month-2years of age)

Sr.	Pt.name	MR. #	Age	Weigh	Diagnosis	Prescribed	Calculated	Analysis
#				t (kg)		dose (TDS)	dose (TDS)	
1.	Maria	203189	1.3Y	15kg	Vomiting, Fever, Fits	225mg	15*15=225mg	Compliance
2.	Hamza	208524	1Y	7.2kg	Fever, Cough	108mg	15*7.2=108mg	Compliance
3.	Meerab	203262	1Y	5.6kg	Fever, Respiratory distress	85mg	15*5.6=84mg	Compliance
4.	Hadia	204465	1Y	10kg	Room sunflower	200mg	15*10=150mg	Non- Compliance
5.	M.Arslan	200318	0.5Y	10kg	Pyomeningitis	150mg	15*10=150mg	Compliance
6.	Zoha	206946	8M	4.6kg	VSD with bronchopneumonia	50mg	15*4.6=69mg	Non- Compliance
7.	Ali Hussain	191196	2M	зkg	TGA with VSD, Bronchopneumonia	45mg	15*3=45mg	Compliance
8.	Arslan	193886	8M	6kg	Labioplasty	90mg	15*6=90mg	Compliance
9.	M.Ali	196031	2M	4kg	Intracranial bleeds	80mg	15*4=60mg	Non- Compliance
10.	Awais	180898	22M	10kg	Cerebral hypoplasia	150mg	15*10=150mg	Compliance
11.	Zeeshan	216633	1.9Y	12.5kg	Post meningitis sequale with aspiration pneumonia	190mg	15*12.5=187.5	Compliance
12.	Eman Fatima	204171	11M	7kg	Stroke & Meningitis	100mg	15*7=105	Compliance
13.	Sulman	207459	2Y	11kg	DBD	200mg	15*11=165	Non- Compliance
14.	Khadija	201210	18M	7.5kg	Immunodeficiency & Sepsis	112mg	15*7.5=112.5	Compliance
15.	Bisma	206209	2Y	11kg	Anemia	165mg	15*11=165	Compliance
16.	M.Ahmad	214407	4M	6	Pyomeningitis	90mg	15*6=90	Compliance
17.	Hadia	213842	5M	3.2	Sepsis	45mg	15*3.2=48	Compliance
18.	Noor	209555	9M	8.7	Sepsis	140mg	15*8.7=130.5	Non- Compliance
19.	Shakeela	214307	18M	8.9	Broncho pneumonia	135mg	15*8.9=133.5	Compliance

Sr. #	Pt.name	MR. #	Age (years)	Weight (kg)	Diagnosis	Prescribed dose (TDS)	Calculated dose (TDS)	Analysis
1.	Moaz	182976	2.6Y	5kg	Brain abscess	75mg	15*5=75mg	Compliance
2.	M.Tahir	183017	5Y	10kg	Post encephalitis with aspiration pneumonia	150mg	15*10=150mg	Compliance
3.	Ayan Ali	197074	4Y	13kg	Meningoencephalitis	260mg	15*13=195mg	Non- Compliance
4.	Muqaddas	197795	3.6Y	11kg	Left sicked stroke	200mg	15*11=165mg	Non- Compliance
5.	Moeen	187976	2.6Y	5kg	TGA with brain abscess	45mg	15*5=75mg	Non- Compliance
6.	Swera	201650	3Y	9kg	Restrictive cardiomyopathy	140mg	15*9=135mg	Compliance
7.	M.Ali	199423	4Y	12kg	Ventricular Tab	50mg	15*12=180mg	Non- Compliance
8.	Sana	204222	2.6Y	13kg	TB with pleural effusion	195mg	15*13=195mg	Compliance
9.	Hadia	199858	4Y	14kg	Cough, Fever	200mg	15 * 14=210mg	Compliance
10.	Farwa	211418	3.6Y	13kg	Rash, Fever, Vomiting	130mg	15*13=195mg	Non- Compliance
11.	lqra	211626	5Y	15kg	Encephalitis	220mg	15 * 15=225mg	Compliance
12.	Rehan	187935	4Y	9kg	ROTB, Fever, Cough	135mg	15*9=135mg	Compliance
13.	Anam	199058	5Y	14kg	Vomiting, Fever, Cough	200mg	15*14=210mg	Compliance
14.	Ali Hassan	181648	6Y	15kg	Pyomeningitis	300mg	15*15=225mg	Non- Compliance
15.	Shahroon	191274	6Y	11kg	CHD, TOF	250mg	15*11=165mg	Non- Compliance
16.	Ahmad	188581	6Y	20kg	ADEM	400mg	15*20=300mg	Non- Compliance
17.	Momin	211971	5Y	15kg	SSPE	150mg	15*15=225	Non- Compliance
18.	Mahnoor	196654	3Y	7kg	Pyomeningitis& Sinus venous thrombosis	140mg	15*7=105	Non- Compliance

Table 3: Vancomycin dose in young child (2-6years of age)

 Table 4: Vancomycin dose in child (6-12years of age)

Sr. #	Pt.name	MR.#	Age (years)	Weight (kg)	Diagnosis	Prescribed dose (TDS)	Calculated dose (TDS)	Analysis
1.	Nimra	207296	12Y	зokg	Pyomeningitis	600mg	15*30=450mg	Non- Compliance
2.	Hanan	203455	9Y	20kg	Fever, Cough	400mg	15*20=300mg	Non- Compliance
3.	Tahira	210550	10Y	19kg	ADEM	285mg	15*19=285mg	Compliance
4.	M.Shafay	319898	7Y	22kg	Posterior fossa tumor	330mg	15*22=330mg	Compliance
5.	Sher Zaman	177412	9Y	28kg	Head Injury	500mg	15*28=420mg	Non- Compliance
6.	Eman	193323	12Y	25kg	K/C of epilepsy	375mg	15*25=375mg	Compliance
7.	M.Azam	214356	11Y	22kg	ТВМ	350mg	15*22=330	Non- Compliance
8.	Hassan	199735	7.6Y	24kg	K/C of megaloblastic anemia	350mg	15*24=360	Compliance

Sr. #	Pt.name	MR.#	Age (years)	Weight (kg)	Diagnosis	Prescribed dose (TDS)	Calculated dose (TDS)	Analysis
1.	Siddique	192711	14Y	30kg	Brain abscess	500mg	15*30=450mg	Non- Compliance
2.	Arif	195664	14Y	30kg	Meningoencephalitis	500mg	15*30=450mg	Non- Compliance
3.	Rehman	191135	14Y	30kg	K/C of epilepsy and hydrocephalus	600mg	15*30=450mg	Non- Compliance



 Table 5: Vancomycin dose in Adolescent (12-18 years of age)

Figure 1: Rational use of Vancomycin in Pediatrics