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Frequency Of Neonatal Bacterial Sepsis In Preterm & Low-birth weight Babies At Kangaroo Mothercare Ward CMC Children Hospital Larkana

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Abstract: One of the main sources of morbidity and mortality among term and pre-term babies is attributed to neonatal sepsis. With minimal information on neonatal sepsis in our country and locality, this study was led to decide the rate of clinical neonatal sepsis in low birth weight and preterm neonates and assess the clinical signs and bacteriological agents. The aim of this study is to determine the frequency of neonatal bacterial sepsis in preterm & low birth weight babies at kangaroo mother care ward of CMC Children Hospital SMBBMU Larkana. A cross-sectional study was carried out in Kangaroo Mother care ward from 1st September 2021 to 28th February 2022 at CMC Children Hospital SMBBMU Larkana. Neonates with sepsis and pre-term low-birth weight were included. Data analysis was run on SPSS 21. From 156 cases female to male ratio is 15:11, with a mean age of 6.02±0.5 days. The mean weight of newborns at birth ranged from 1500 gram to 2499 gram. The results showed that most of the neonates faced early onset of sepsis and the most common bacterial organism was E. coli followed by Klebsiella species, Enterobacter species Staphylococcus aureus. Neonatal sepsis is a major cause of mortality and morbidity in newborn, particularly in developing countries. The spectrum of bacteria which causes neonatal sepsis varies in different parts of the world. The most common organism responsible for early onset sepsis in our study is E. coli.

Keywords: Bacteriological frequency, Kangaroo Mother Care, Neonatal sepsis.

INTRODUCTION

Neonatal sepsis is a major clinical problem in the field of neonatology, and is a major cause of morbidity and mortality in term and low birth weight infants (Stoll et al., 2002). Sepsis is a 'systemic inflammatory response to infection in neonates', with early onset sepsis (EOS) being defined as the onset of symptoms occurring in the first 72 hours after birth and late onset sepsis (LOS) after the first 72 hours (Camacho-Gonzalez et al., 2013). Neonatal sepsis is a condition that occurs in different parts of the world but is more

prevalent in low-middle-income countries (LMICs) where there is limited access to healthcare (Fleischmann-Struzek et al., 2018).

Neonatal sepsis may have variable clinical presentations and may be difficult to diagnose (Haque, 2010). Symptoms include changes in bodily temperature, lethargy, difficulty breathing, and difficulty absorbing food (Gerdes, 2004). Effective management can only be carried out after bacterial pathogens have been identified, and the bacterial spectrum varies according to geographical area, and population (Bizzarro et al., 2005). Esherichia coli, Staphylococcus aureus, and Klebsiella species, especially those associated with low birth weight (LBW), and prematurity (Hornik et al., 2012) are the most commonly reported organisms. Moreover, interventions based on evidence such as Kangaroo Mother Care (KMC) have been found to be promising in addressing neonatal sepsis challenges especially in resource-limited settings (Boundy et al., 2016). KMC encourages mother-infant interaction, enhances thermal stability and breastfeeding, thereby reducing the likelihood of infections. The objective of the study is to find out the prevalence of neonatal sepsis in low birth weight and preterm babies at CMC Children Hospital, SMBBMU, Larkana. It also aims to determine the clinical manifestations of sepsis and the most common microorganisms causing sepsis. The results will add to the existing body of knowledge, and will guide clinical practice locally.

METHODOLOGY

It was a cross-sectional study conducted at Kangaroo Mother Care ward of CMC Children Hospital SMBBMU Larkana from 01st September 2021 up to 28th February 2022. The study was a cross sectional design which enabled data collection at one time and gave a snapshot of the prevalence of neonatal sepsis among the target population. The study was done by non-probability consecutive sampling, which was the study of all the neonates admitted to the ward that fulfilled the inclusion criteria. A total number of 156 neonates were sampled using a sample size calculator developed by WHO, based on the assumption of a 3.8% prevalence rate of neonatal sepsis in Pakistan, confidence interval of 95% and margin of error of 3%. • Infants who have unequivocal clinical and laboratory evidence of sepsis. Low weight (≤ 2500 grams) and/or prematurity (gestational age <37 weeks) were cited as conditions. Symptoms of sepsis (e.g., lethargy, poor feeding, and respiratory distress) and maternal risk factors (e.g., fever, foul-smelling discharge).

With the approval of the ethical review committee, data was obtained by pre-designed proforma. Patient data that is relevant to the problem was noted, such as demographics, clinical history and lab findings. For confirmation of the diagnosis of neonatal sepsis, blood samples (3-5 ml) were taken for culture. The data collected was analysed using SPSS version 21. Descriptive Statistics were used to summarize the participant characteristics and prevalence rates. Frequencies and percentages of the bacteriological agents detected were calculated and chi-square tests were used to determine the association between clinical and bacteriological results at $p < 0.05$. Confidentiality and anonymity of each of the participants were kept with utmost care. Verbal informed consent was obtained, and the caregivers were informed about the purpose, procedures, risks and benefits of the study. The data of the participants was kept secure and only in the hands of authorized persons.

RESULTS

Neonate Characteristics

A total of 156 neonates (1 – 28 days old, mean 6 days) were included in this study. Most were male and gestational ages ranged from 28 to 36 weeks (mean 30 weeks). The weight of the newborns ranged from 1500 to 2499 g. Figures 1, 2 and 3 show the age, gender and birth weight distribution respectively.

Clinical Investigations

Body Temperature: Of the neonates, 69% had temperatures of <36°C and 31% were of >38.5°C. Cardiovascular Instability: Variables related to cardiovascular instability are summarized in Table 1. Skin and Subcutaneous Lesions: Information on petechial rashes and sclerema is given in Table 3. Respiratory Stability: Investigations into respiratory conditions, such as increased oxygen needs and episodes of tachypnea and apnea, are shown in Figure 5.

Figure 6: Gastrointestinal Investigation – for gastrointestinal problems such as distended abdomen and poor feeding. Laboratory Investigations Laboratory tests revealed evidence of sepsis with blood counts and blood sugars shown in Table 4. Other clinical signs noted were irritability (55.1%), lethargy (48%) and hypotonia (22.4%). Bacterial Profile Investigations Of the 119 positive blood cultures, seven types of bacteria were identified; the most common bacteria identified were E. coli, Klebsiella spp., Enterobacter spp and Staphylococcus aureus. The distribution of these organisms with respect to onset of sepsis is shown in Table 5 and in Figure 6. Antibiotic

.

Susceptibility Patterns E. coli was found to be 65% sensitive to imipenem and meropenem, and resistant to the commonly used antibiotics such as penicillins and ampicillin. Klebsiella spp. was sensitive to imipenem and ceftazidime, having high levels of resistance to cefotaxime (90%) and gentamicin (75%). Enterobacter spp. was found to be susceptible to gentamicin, imipenem and meropenem, but resistant against penicillins and vancomycin. S. aureus was resistant to several of the commonly used antibiotics and 100% sensitive to vancomycin and 61% sensitive to clindamycin. The antibiotic susceptibility patterns are summarized in Table 7

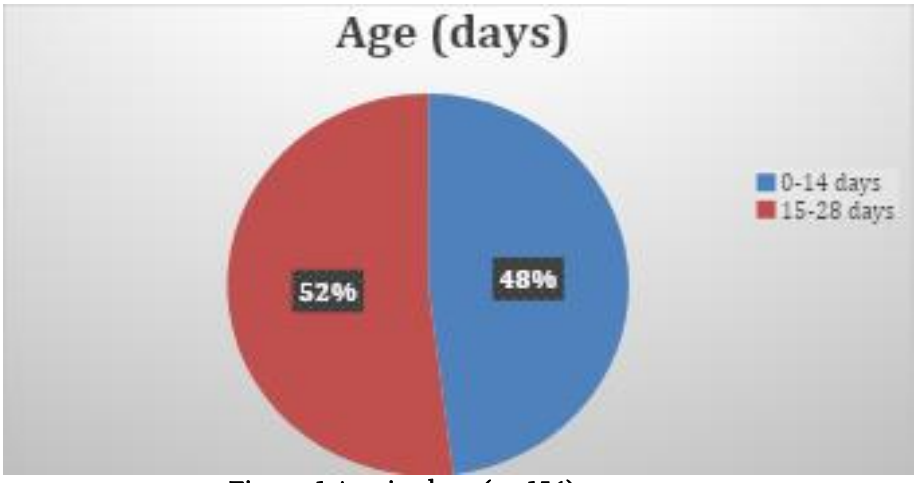

Figure 1 Age in days (n=156)

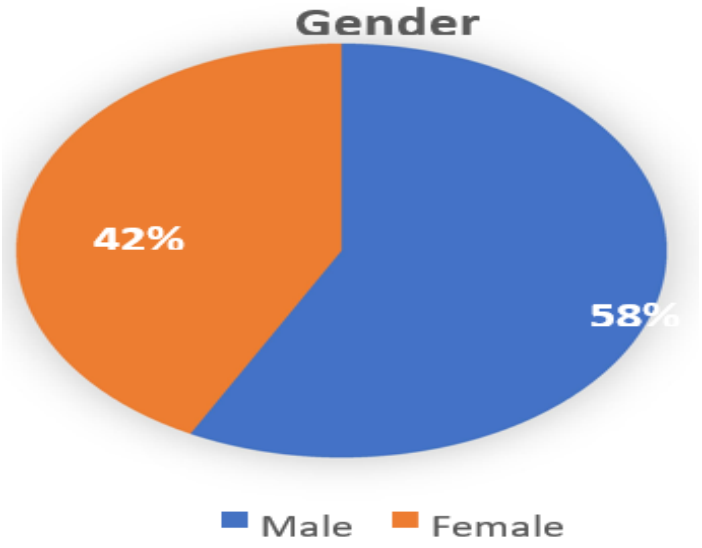

Figure 2 Gender of neonates (n=156)

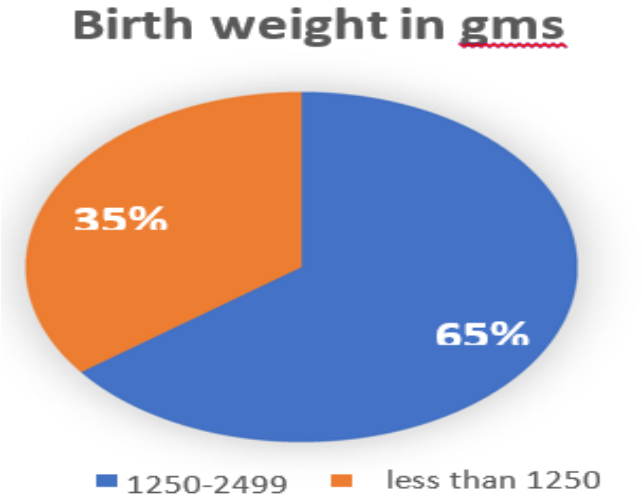

Figure 3 Birth weight of neonates in grams (n=156)

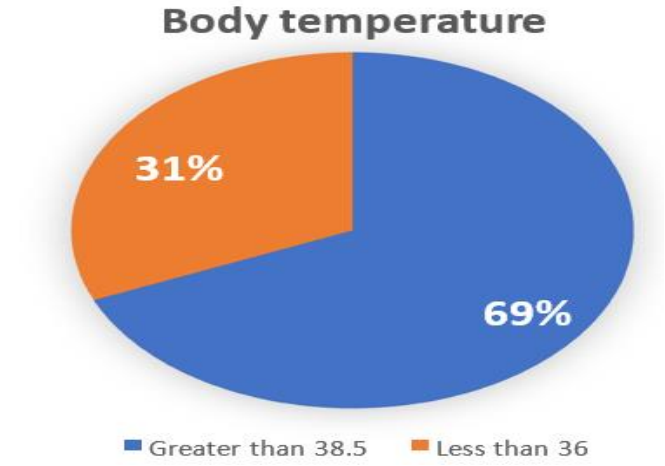

Figure 4 Body Temperature in degree centigrade

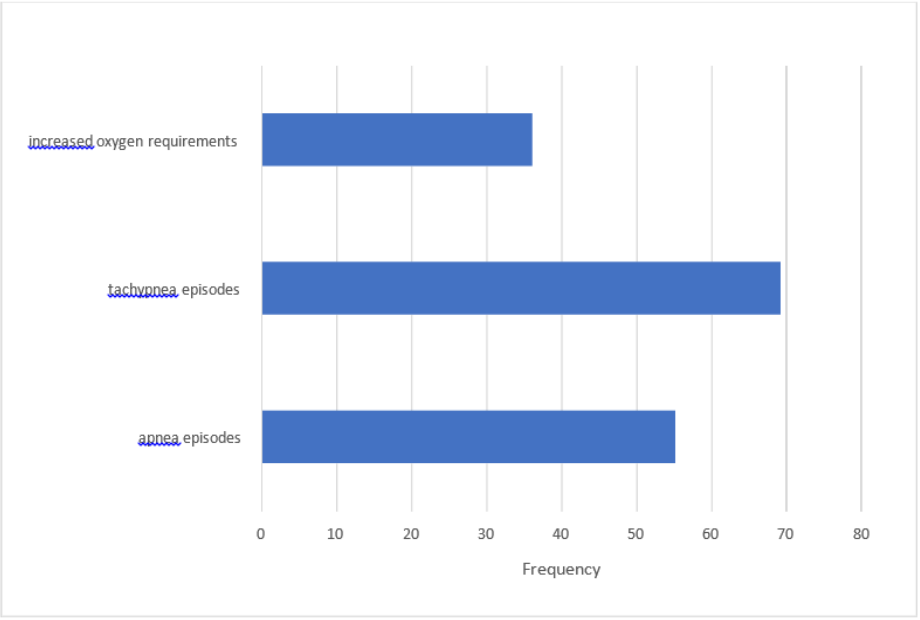

Figure 5. Respiratory Characteristics of neonates

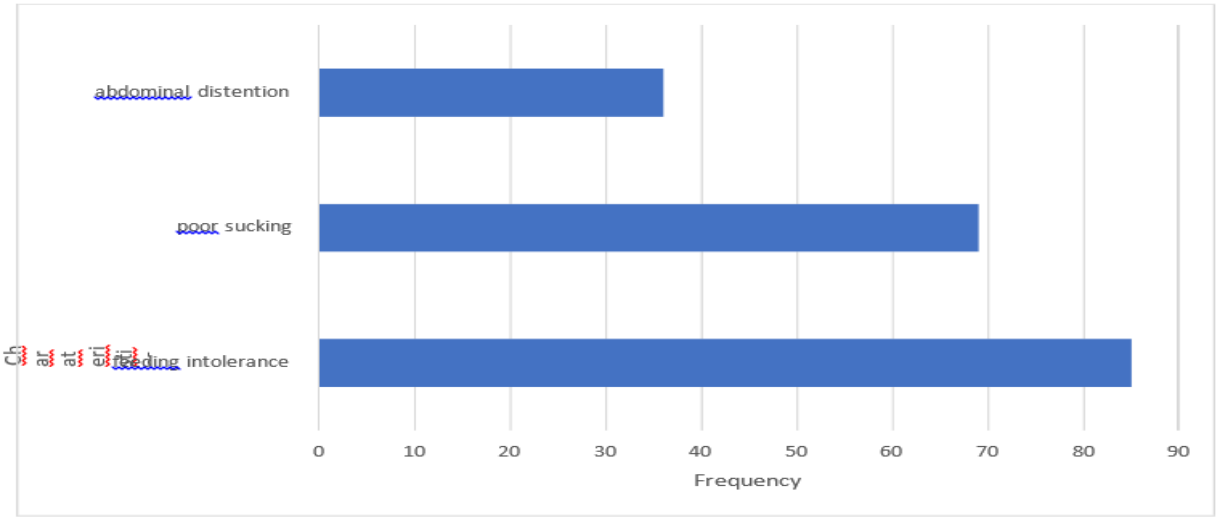

Figure 6 Gastrointestinal characteristics of neonates with sepsis

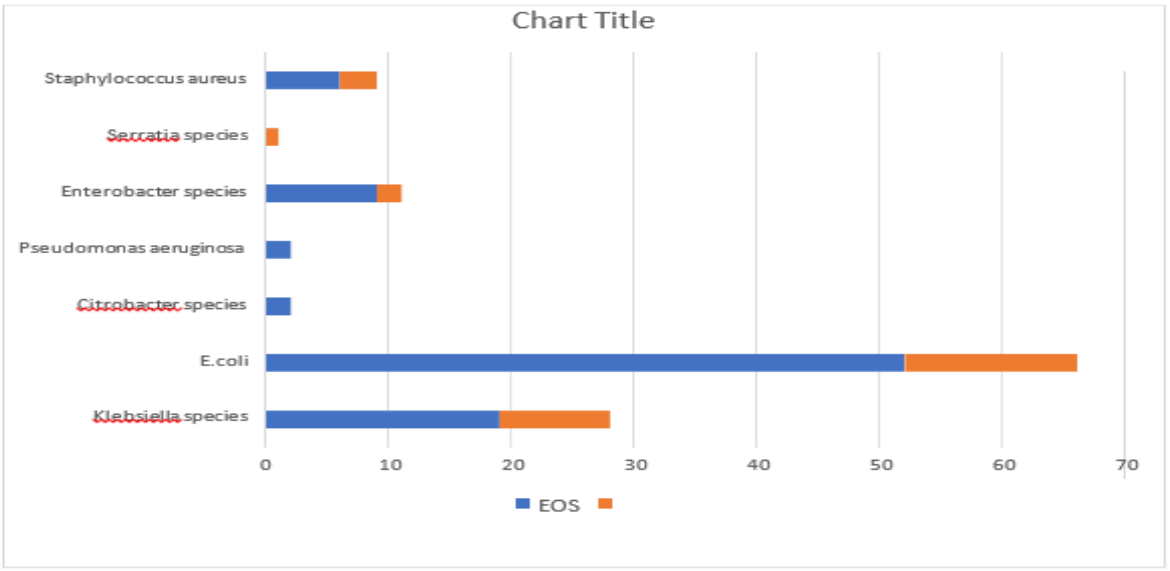

Figure 7 Bacterial Characteristics

Table 1 Cardiovascular characteristics

Variables	Frequency	Percentage
Bradycardia	68	43.5
Tachycardia	52	33.3
Rhythm instability	86	55.1
Urinary output (< 1mL/kg/h)	80	51.2
Hypotension	32	20.5
mottled skin	56	35.8
impaired peripheral perfusion	40	25.6

Table 2 Muco-cutaneous lesions

Variables	Frequency	Percentage
Petechial rash	38	24.3
Sclerema	77	49.3

Table 3 Laboratory investigation of neonates with sepsis

Variables	frequency	percentage
White blood cell count		
$<4 \times 10^9$ cells/L	67	42.9
$>20 \times 10^9$ cells/L	52	33.3
immature to total neutrophil ration (>0.2)	52	33.3
Platelets ($<100x10^9$/L)	75	48
Glucose intolerance		
Hyperglycemia (blood glucose >180mg/dL or 10mM)	40	25.6
Hypoglycemia (blood glucose <45 mg/dL or 2.5mM)	86	55.1

Table 4 Bacterial Growth (n=156)

Bacterial Growth		
Yes	119	76.28%
No	37	23.72%
Total	156	100%

Table 5 Bacterial profile (organisms)

Variables	Frequency	Percentage
E.coli	66	55.46
Klebsiella species	28	23.53
Enterobacter species	11	9.34
Staphylococcus aureus	9	7.56
Pseudomonas aeruginosa	2	1.68
Citrobacter species	2	1.68
Serratia species	1	0.84
Total	119	100

Table 6 Bacterial Characteristics

Variables	EOS	LOS	p-value
E.coli	52	14	0.041
Klebsiella species	19	9	0.030
Enterobacter species	9	2	0.01
Staphylococcus aureus	6	3	0.04
Pseudomonas aeruginosa	2	0	0.071
Citrobacter species	2	0	0.86
Serratia species	0	2	0.21

Total (n=119)	90	29	<0.05

Table 7: Antibiotic susceptibility Pattern in organisms

Antibiotic	Sensitive/ Resistant	Escheria Coli	Klebsiella Species	Enterobacter Species	Staphylococcus Aureus Species
Ampicillin	S	00	04	11	00
	R	66	24	00	09
Amikacin	S	44	18	04	04
	R	22	10	07	05
Cefotaxime	S	00	04	05	02
	R	66	24	06	07
Vancomycin	S	00	00	00	08
	R	66	28	11	01
Penicillin G	S	00	00	04	01
	R	66	28	07	08
Imipenem	S	44	28	11	03
	R	22	00	00	06
Gentamycin	S	05	00	11	04
	R	61	28	00	05
Ceftazidime	S	40	26	10	00
	R	26	02	01	09
Clindamycin	S	00	03	00	07
	R	66	25	11	02
Meropenem	S	44	28	11	03
	R	22	00	00	06

Stay At KMC Ward

Neonates admitted in KMC ward stayed about 7-14 days, after which patients were discharged on completion of treatment with appropriate weight gain, sick patients were shifted back to NICU/HDU.Neonates Stay at KMC Ward is shown in **Table 8**

Outcome of Treatment

In our study it was observed that out of 156 babies, 120 babies were discharged with appropriate weight gain, 16 babies were shifted back to NNU/HDU, and out of these Sixteen, 4 patients were expired on meropenem resistant organism E.coli having birth weight <1500 g. 10 patients LAMA (Left against medical advice), 15 patients discharged on request.

Table 8 shows the outcome of treatment of babies at KMC ward

Table 8: Outcome of Treatment

Status	Birth Weight	Gestational Age	Male/Female	Total	
Stay In KMC Ward	< 1500g = 14 days Birth weight >1500g to 2499g= 7days	28-37 weeks	90/66	7-14 days	
Discharged	AT 2000 to 2499 g	34-36 weeks	68/52	120	Total n= 156
LAMA	<1500 g	30-36 weeks	6/4	10	
DOR	<1500 g	32-37 weeks	9/6	15	
Back To NNU/HDU	<1500 g	<32 weeks	7/4	11	

Expired at NNU/HDU out of 11	<1500 g	<30 weeks	1/3	4

DISCUSSION

In addition to survival, sepsis also affects the newborn's brain development and raises overall care costs. Antimicrobial medications are administered under close surveillance to prevent any therapy delays. The selection of the precise anti-microbials is crucial and should be based on the culture and response effects of each patient and NNU setup.

Recent developments in newborn care have successfully increased survival rate and reduced confusions in premature neonates. However, sepsis continues to be a significant and frequent cause of mortality and morbidity in very LBW babies (3-6). Effective management of sepsis depends on early recognition of clinical indications indicating serious contamination and a suitable selection of precise antimicrobial drugs (39-41). Decisions about observational anti-microbials should be supported by epidemiologic data on subsequent bacteria and how well they respond to therapy. It is evident that the causing germs for neonatal sepsis varies with time and geographic dispersion, even if there may be distinct risk factors for sepsis in neonates with extremely low birth weight compared to term babies.

According to previous study in Taiwan, the prevalence of newborn sepsis increased from 3.0% to 9.3%. (80-82). These publications, however, did not often focus on VLBW populations. VLBW newborn newborns have the highest risk of infection because of their reduced susceptibility, delayed TPN, central vein catheterization, and mechanical breathing (83-86). The most recent information about this high-danger group is provided by our study.

In our study, E. coli was by far the most common strain and EOS accounted for the majority of sepsis cases. Additionally, same perceptions were noticed in several studies conducted worldwide, particularly in low- and middle-income nations (77, 87-90). In contrast to prior.

CONCLUSION

In conclusion, Sepsis continues to pose a major risk to LBW newborns & the clinicians should be aware for any hidden signs of bacterial infection. LBW newborns must be cared for using the wise and optimal and early management tools. Kangaroo Mother Care technique is a major tool for the prevention of septicemia especially in pre-term and low birth weight babies, which is inexpensive, easily applicable in countries having minimal resources and incubators facilities. In our study E. coli was the most common offending agent that causes septicemia in preterm Low Birth Weight babies at KMC ward.

In our study among all 7 bacterial isolates, E. coli was the most common isolate 66 (55%) and sensitive to Meropenem and Imipenen. Escherichia species were resistant to the commonly used antibiotics Penicillins, Ampicillin, Amikacin, Cefotaxime and others. Klebseilla species showed sensitivity to Imepenem and Ceftazidime and resistant to cefotaxime 90% and gentamycin 75%, Enterobacter species 11(14.28%) were found sensitive to Clindamycin and Gentamicin, has become resistant to Penicillins, Vancomycin and Ampicillins. Staphylococcus Aureus showed 100% sensitivity to Vancomycin and 61% to Clindamycin while it was highly resistant to Pencilin G, Ampicillin, Gentamycin, Ceftazidime.

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