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THE POTENTIAL IMPACT OF ZINC SUPPLEMENTATION AMONG CHILDREN WITH COVID-19 INFECTION

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ABSTRACT

Objective: In this study our main goal is to evaluate the potential impact of zinc supplementation among children with covid-19 infection. **Method:** This experimental and case control observational type study was carried out at tertiary medical college and child health institute from May 2020 to December 2020. A total 40 children included in the study, hospitalized for SARS-CoV-2 RT-PCR-positive patients' investigation for serum zinc levels. Covid-19 infected children with lower zinc level considered as a group-1, n=20 whereas Covid-19 infected children with adjuvant zinc therapy considered as a group-2, n=20. **Results:** During the study, most of the patients belong to 3 years 2 months to 4 years 2 months age group. Cough with running nose followed by sore throat, nasal blockage were the common symptom in both groups. In group-1 45% children suffered from acute respiratory distress syndrome followed by 20% had sepsis, 10% admitted in ICU, 20% stayed in hospital ≥7 days and 5% patients were died. Whereas, in group-2 15% children suffered from acute respiratory distress syndrome followed by 10% had sepsis and no patients had died. In group-1 80% patients discharge with on request followed by only 9.5% patients discharge with good recovery where as in group-2 83.3% were discharged with good recovery followed by 9.3% discharge on request, 1.9% were DORB and referred. **Conclusion:** Role of zinc in COVID-19 infected children and establishing the appropriate dosage to improve their survival. With more research, zinc could provide a cost-effective therapy for COVID-19, certainly the need of the hour in this pandemic.

KEYWORDS: Covid-19 infection, zinc supplementation, pandemic situation.

INTRODUCTION

Zinc is an essential trace element required for maintaining intestinal cells, bone growth, and immune function. Children who are living in low-income settings are often undernourished and zinc deficient.[1-2] Severe zinc deficiency has been associated with stunting of growth, impaired immunity, skin disorders, learning disabilities and anorexia.[3-4] Deficiencies may arise from the insufficient intake of foods containing zinc or insufficient absorption. Most foods high in zinc are of animal origin, such as meats, fish and dairy products. These foods may be more difficult to access for low-income populations. Dietary fibre and compounds called phytates, which are often found in foods such as cereals, nuts and legumes, bind to zinc and result in poor absorption.[5-6] Frequent diarrhoea, that is also associated with chronic undernutrition, may further deplete body stores of zinc.[7-8]

Zinc is a trace element with potent immunoregulatory and antiviral properties. Zinc is essential for growth, reproductive health, immunity, and neurobehavioral development (International Zinc Nutrition Consultative Group.[9] The recommended daily intake of zinc ranges between 3 mg and 16 mg. Under physiological conditions, zinc is essential for cellular growth and the maturation of immune cells, particularly in the development and activation of T-lymphocytes.[10] Studies have shown that around 10% of our body proteins utilize zinc and that zinc is a cofactor in at least 200 immunomodulatory and antioxidant reactions.[11] Prolonged deficiency is associated with immune system dysfunction, sterility in males, neurosensory disorders, and decreased body mass.[12]

In this study our main goal is to evaluate the potential impact of zinc supplementation among children with covid-19 infection.

OBJECTIVE

- To assess the potential impact of zinc supplementation among children with covid-19 infection.

METHODOLOGY

Study type

- This was a experimental and case control observational type study.

Place of the study and period of the study

- The study was carried out at tertiary medical college and child health institute from May 2020 to December 2020.

Study population and sample size

- A total 40 children included in the study, hospitalized for SARS-CoV-2 RT-PCR-positive patients' investigation for serum zinc levels. Covid-19 infected children with lower zinc level considered as a group-1, n=20 whereas Covid-19 infected children with adjuvant zinc therapy considered as a group-2, n=20.

Sampling method

- Sample of the study was selected by purposive method.

Procedure of data collection

Detailed history was taken then thorough clinical examinations were done. All these data were collected by using preformed data sheet.

Data analysis

- Data entry, quality control and data cleaning had been done following standard method. All data forms and questionnaires had been checked for errors and necessary correction had been made before data entry. Data had been entered using data entry program with built in range and consistency checks (SPSS). The prevalence rate had been determined by simple percentages. Chi-square test was used to assess comparison between different groups. A p-value <0.05 was considered statistically significant.

RESULTS

In table-1 shows age distribution of the patients where most of the patients belong to 3 years 2 months to 4 years 2 months age group. The following table is given below in detail:

Table 1: Age distribution of the patients.

Age group	Percent	Mean	Std.
1-2 years	10.2	1.574	1.09924
3 years 2 month - 4 years 2 months	75.5		
4 years 3 months to 5 years 3 months	10.2		
5 years 4 months to 6 years	4.1		
Total	**100.0**		

In figure-1 shows gender distribution of the patients where most of the patients where most of the patients were male, 73%. The following table is given below in detail:

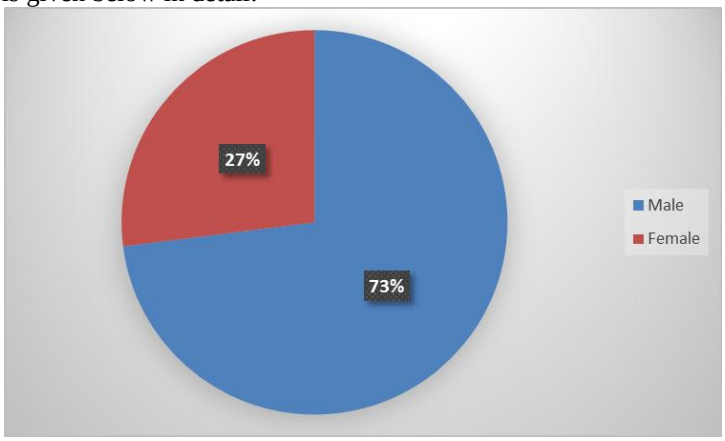

Figure 1: Gender distribution of the patients.

In figure-2 shows residential area of the patients where 92.1% were coming from urban. The following figure is given below in detail:

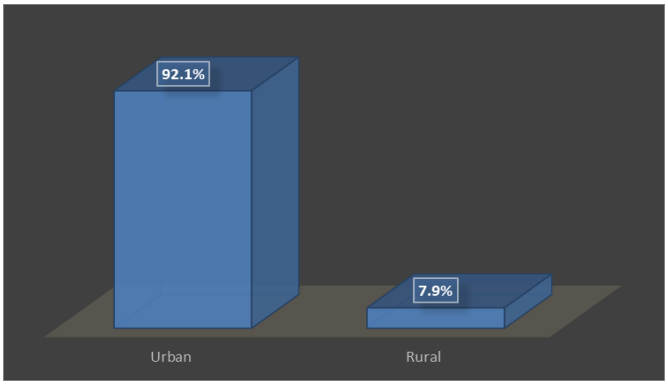

Figure 2: Residential area of the patients.

In table-2 shows distribution of the patients according to symptom where in group-1 36% had cough followed by 12% had cough with running nose, 9.1% had dry cough, 6.1% had cough with nasal blockage, tastelessness, weakness, breathless. The following table is given below in detail:

Table 2: Distribution of the patients according to symptom.

Symptom	Group-1, %	Group-2, %
Dry cough	9.1	8.0
Breathless	6.1	5.1
Dry cough and breathless	3.0	2.0
Cough	36.4	30
Common Cold, sore throat	9.1	9.1
Cough, Nasal Blockage	6.1	6.1
Cough, Running nose	12.1	16
Nasal Contestation	3.0	3.0
Cough, Breathlessness, restlessness and body pain	3.0	3.0
Myalgia, Dry cough, Chest tightness, chest pain	3.0	3.0
Tastelessness, weakness	6.1	6.1

In table-4 shows after admission complication in the study group where in group-1 45% children suffered from acute respiratory distress syndrome followed by 20% had sepsis, 10% admitted in ICU, 20% stayed in hospital ≥7 days and 5% patients were died. Whereas, in group-2 15% children suffered from acute respiratory distress syndrome followed by 10% had sepsis and no patients had died. The following table is given below in detail:

Table 4: After admission complication in the study group.

Complications	Group-1, %	Group-2, %
Acute respiratory distress syndrome	45%	15%
Sepsis	20%	10%
ICU	10%	0%
Hospital stay ≥7 days	20%	0%
Death	5%	0%

In table-5 shows mode of discharge where in group-1 80% patients discharge with on request followed by only 9.5% patients discharge with good recovery where as in group-2 83.3% were discharged with good recovery followed by 9.3% discharge on request, 1.9% were DORB and referred. The following table is given below in detail:

Table 5: Mode of discharge.

Mode of discharge	Group-1, %	Group-2, %
DOR	80%	9.3
Discharge with good recovery	9.5%	83.3
DOE	6.7	3.7
DORB	1.9	1.9
Referred	1.9	1.8

DISCUSSION

In vitro studies have shown that SARS-CoV-2 viral spike protein interacts with angiotensin-converting enzyme 2 (ACE2) and the serine protease transmembrane protease serine 2 (TMPRSS2) in the alveoli, permitting its entry into the cells. Interestingly, ACE2 is a zinc-dependent peptidyl dipeptide hydrolase composed of two subdomains (I and II), of which N-terminal containing subdomain I and C-terminus containing subdomain II are involved with zinc binding.[10]

This process is facilitated and coordinated by amino acids His374, His378, Glu402 (HEXXH + E motif) and a molecule of water at subdomain I and by amino acids Arg169, Trp477, and Lys481 with a chloride ion at subdomain two.[11]

Earlier studies demonstrated that a decreased zinc level favours this interaction of ACE2 with SARS-CoV-2 spike protein and likewise that an increased zinc level inhibits ACE2 expression resulting in reduced viral interaction.[12-13]

Zinc supplements are traditionally prescribed for common cold ailments, usually caused by coronaviruses. Zinc supplements have been associated with a shortened duration of symptoms, reduced severity of illness, and more importantly with reduced morbidity and mortality in children.[14]

Zinc has been shown to exhibit antiviral properties by inhibition of RNA synthesis, viral replication, DNA polymerase, reverse transcriptase, and viral proteases.[15] In our study where covid-19 infected children with zin supplementation, group-2 had less complication than without supplementation group-1. In group-1 45% children suffered from acute respiratory distress syndrome followed by 20% had sepsis, 10% admitted in ICU, 20% stayed in hospital ≥7 days and 5% patients were died. Whereas, in group-2 15% children suffered from acute respiratory distress syndrome followed by 10% had sepsis and no patients had died. Which is supported to several studies.[10-12]

CONCLUSION

Role of zinc in COVID-19 infected children and establishing the appropriate dosage to improve their survival. With more research, zinc could provide a cost-effective therapy for COVID-19, certainly the need of the hour in this pandemic.

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