

Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia
 Open Access Macedonian Journal of Medical Sciences. 2020 Mar 15; 8(B):45-48.
<https://doi.org/10.3889/oamjms.2020.3233>
 eISSN: 1857-9655
 Category: B - Clinical Sciences
 Section: Infective Diseases



Correlation of Capute Scores with CD4 Count among Human Immunodeficiency Virus-infected Children in Sanglah Hospital, Bali, Indonesia

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Abstract

Edited by: Ksenija Bogoeva-Kostovska
Citation: Supadma IN, Budiapsari PI, Wati KDK, Artana D. Correlation of Capute Scores with CD4 Count among Human Immunodeficiency Virus-infected Children in Sanglah Hospital, Bali, Indonesia. Open Access Maced J Med Sci. 2020 Mar 15; 8(B):45-48. <https://doi.org/10.3889/oamjms.2020.3233>
Keywords: Capute score; CD4; HIV; Children
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Received: 17-Jun-2019
Revised: 06-Feb-2020
Accepted: 27-Feb-2020
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Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist
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BACKGROUND: Cognitive, motoric, and language development in a human immunodeficiency virus (HIV)-infected child is an important issue that affects developmental milestone and quality of life. The effect of HIV infection on cognitive function must be detected early to prevent delayed cognitive, motoric, and language function.

AIM: This study aimed to assess the correlation of cognitive scores with CD4 count among HIV-infected children in pediatrics polyclinic Sanglah Hospital, Bali.

METHODS: This cross-sectional study recruited 68 HIV-infected children age 0–36 months old as participants. Cognitive score was assessed using Cognitive Adaptive Test/Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS) scores and HIV status, and CD4 count was obtained from the medical record.

RESULTS: The result showed that mean of CD4 count among subject was 29.85 cells/mm³, there was positive correlation between CAT scores with CD4 count ($r = 0.33$, $p = 0.006$) and also between CLAMS scores with CD4 count ($r = 0.307$, $p = 0.01$).

CONCLUSION: It can be concluded that CD4 count correlated with Capute scores on HIV-infected children.

Introduction

The human immunodeficiency virus (HIV) is a lymphotropic and neurotropic retrovirus that belongs to the Lentiviridae subfamily, causing a slow and chronic infection [1], affecting several organs and systems. Among them, the central nervous system is frequently affected, causing delays in neurodevelopment that can be one of the first symptoms of the disease [1], [2], [3], [4], [5], [6]. Children with vertically transmitted HIV can develop rapid or slow progressive psychoneuromotor development deceleration, which can begin as soon as six months of age. Other children may have static encephalopathy [1], [2], [3], [4], [5], [6].

Abnormalities and neurocognitive development among HIV-infected children become very important since the HIV cases in children were first reported in 1980 in the United States [1]. HIV causes serious cell damage due to symptoms of acquired immunodeficiency syndrome. One of the serious cell damage is found in the brain that manifested into neurocognitive development. Symptoms were found to vary from

moderate to severe. Moderate symptoms include abnormal muscle tone, while severe symptoms include progressive developmental delay and loss of ability in the previous milestone [2]. HIV infection in children can cause brain damage in the form of neurocognitive disorders. Untreated HIV-infected children are associated with the development of cognitive deficits, motoric, language, and psychological impairments [3]. Early developmental delays in language and cognitive abilities can affect various functions in daily life. Early identification and intervention can prevent cognitive impairment and language [4]. The cause of the problems is unclear, whether the impact of HIV itself in decreasing the mitochondrial DNA as found in HIV cases using antiretroviral therapy. One of the early predictor factors of worsen symptom of HIV infection are CD4 count [5].

The Cognitive Adaptive Test/Clinical Linguistic and Auditory Milestone Scale (CAT/CLAMS) was designed for use by primary pediatric health-care providers to screen children for cognitive delay using minimal equipment in a shorter time (usually 15–20 min) [4]. CAT/CLAMS has been demonstrated

in normal children as well as high-risk groups of developmental delayed children between 1 and 36 months of age [7], [8]. This study aimed to assess the correlation of Capute score with CD4 count among HIV-infected children in Sanglah Hospital, Bali, Indonesia.

Methods

This research was conducted in Sanglah Hospital Bali from December 2013 to May 2014. The subjects were collected by consecutive sampling until we reached the minimum number of samples. The cross-sectional analytic study was used to assess the correlation of Capute scores with CD4 count among HIV-infected children. Capute scores consist of two tests Cat and Clams tests will be performed to get Capute scores, and CD4 count was assessed by flow cytometry and HIV status was obtained from serologic test that recorded in the medical record. The Capute scores then classified into normal (>85), suspect (75–85), and mental retardation (<75). Inclusion criteria in this study were 0–36 months HIV-infected children who visit Pediatrics Polyclinic, Sanglah Hospital and got assignment from the parent by informed consent. Subject and the subject's parents refused to participate in the study, subjects with other comorbid diseases, and subject whom loss to follow-up will be excluded from the study.

Ethical consideration

Ethical clearance was obtained from the Department of Research Development of Sanglah Hospital, Faculty of Medicine, Udayana University.

Results

During the study, there were 68 samples as the HIV group and 68 samples were selected as the control group. The characteristics of the study subjects are shown in Table 1. Almost the HIV group was male 37 (54.5%), but in the control group found predominantly female subjects of 38 (55.9%). Both HIV and control group were almost in 12–24-month-old 31 (48.4%) and 33 (51.6%). Almost the HIV group was in the asymptomatic stage. The status of milestone development in the two groups was almost within normal limits. Clinical manifestations that occur in the HIV group were mostly without complaint.

The result of the correlation test showed average of CD4 count was 29.85 cells/mm³, mean of DQ CAT scores was 90.95 ± 10.8, and mean of DQ CLAMS scores 89.22 ± 6.9.

Table 1: Characteristics of the subjects

Characteristics of the subjects	Human immunodeficiency virus group n (%)	Control group n (%)
Gender		
Male	37 (54.5)	30 (44.1)
Female	31 (45)	38 (55.9)
Age (months)		
0–12	14 (45.2)	17 (54.8)
13–24	31 (48.4)	33 (51.6)
25–36	23 (56.1)	18 (43.9)
Stadium of infection		
Asymptomatic	39 (57.4)	0 (0)
Mild	14 (20.6)	0 (0)
Moderate	13 (19.1)	0 (0)
Severe	2 (2.9)	0 (0)
Developmental state		
Mental retardation	1 (1.5)	0 (0)
Delayed speech	2 (2.29)	0 (0)
Normal	40 (58.8)	64 (94.1)
Suspect	25 (36.8)	4 (5.9)
Clinical manifestations		
GIT (diarrhea)	2 (2.9)	0 (0)
GIT (vomiting)	1 (1.5)	0 (0)
Acute respiratory infection	17 (25)	0 (0)
Hyperpigmentation on skin	1 (1.5)	0 (0)
No symptom	42 (61.8)	0 (0)
Wasting syndrome	5 (7.4)	0 (0)

GIT: Gastro Intestinal Tract.

We included all of CD4 count, DQ CAT, and DQ Clams scores in HIV-infected children to get mean then tested by Pearson's correlation test. The result showed a positive correlation of CD4 count with DQ Cat and DQ Clams, as described in Table 2. It means CD4 count significantly correlated with Capute scores.

Table 2: Pearson's correlation of CD4 with Capute score in human immunodeficiency virus-infected children

Variable	Min.	Max.	Mean±SD	r	p
CD4 count	17.50	40.70	29.85 cells/mm ³		
DQ CAT scores	72.30	145.0	90.95±10.8	0.331	0.006
DQ CLAMS scores	71.50	110.0	89.22±6.9	0.307	0.011

CAT: Cognitive Adaptive Test, CLAMS: Clinical Linguistic and Auditory Milestone Scale.

As shown in Table 3, subjects with CD4 <25 cells/mm³ tend to be mental retardation, delayed speech, and suspect for cognitive impairment. in the contrary subject with CD4 > 25 cell/mm³ there were no evidence of mental retardation or delayed speech, and almost in normal cognitive performance in the contrary.

Table 3: Cognitive state based on CD4 count

Category of CD4 count	Cognitive state			
	Mental retardation	delayed speech	Normal	Suspect
<25 cells/mm ³	1	2	4	8
>25 cells/mm ³	0	0	37	16
Total	1	2	41	24

Discussion

CD4 count was the easiest predictor factor of the degree of HIV symptoms, and this study showed its positive correlation with Capute score. In line with previous research obtained that there was a positive correlation between cognitive disorders with CD4 levels [9], [10], [11]. Positive correlation also found between CAT scores and CD4 count (r = 0.418 and p = 0.01). Significant correlation also found between Clams scores with CD4 count (r = 0.529 and p = 0.01). These results indicate that the lower of CD4 count and

the lower CAT/Clams scores. CD4 plays importance role in cognitive function of HIV-infected children, subject with CD4 <25 cells/mm³ had lower cognitive performance than subject with CD4 > <25 cells/mm³. As described previously by Vanprapar *et al.*, microglial cells in neuron play a role in cognitive performance of HIV person [2], [12], [13]. In contrary to a previous study by Igumbor *et al.*, there were little or no associations between the biomedical markers (CD4 count and viral load) and cognitive indicators. However, the quality of life tended to increase with increase in the CD4 cell count [14], [15], [16], [17], [18], [19].

Conclusion

From this study, it can be concluded that Capute scores are significantly correlated with CD4 count. The lower the CD4 count, the lower the cognitive score. Further study should be conducted to analyze the mechanism of HIV infection affect cognitive performance on HIV-infected children before early intervention to prevent cognitive impairment on HIV-infected children.

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