



Status of C - reactive protein (CRP) in HIV Infected Individuals: A Case Control study

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ABSTRACT

C-reactive protein, an acute phase protein recognized as an important indicator of inflammatory conditions. The aim of the study was to examine the concentration of CRP in HIV seropositive and Healthy people in order to recognize the relationship between infection and inflammation involving factors. A case-control study was carried out on 330 participants of whom 110 were HIV seropositive and 220 healthy individuals attending ART centers of Pokhara. A questionnaire was designed to obtain the demography variables like age, sex, and ethnic group. Then, 5 ml of venous samples were collected after taking written consent from the respondent and CRP quantification analysis was performed by nephelometer methods. SPSS version 16 was used for analysis for data. In this study, males were 51.8%, 47.7% and females were 48.2%, 52.3% were in the case and control group respectively. 60% of the case participants were CRP positive and only 5.5% of the control participants were CRP positive. Association of CRP with Case and control showed statistically highly significant (p -value 0.000) with an odds ratio of 26.00 in 95% CI of (12.966-52.137). In the case of a group, mean \pm S.D. of age, CD4 count, and CRP values were 46.77 ± 8.65 , 423.218 ± 237.79 and 12.57 ± 14.40 respectively. In the control group, the mean \pm S.D. of age and CRP value were 31.05 ± 14.26 and 1.48 ± 2.18 respectively. CRP is increased highly in cases so it can be used as an early biomarker which will be helpful in the diagnosis and treatment of the diseases.

Keywords: Case Control; C - reactive protein; HIV; inflammation, nephelometer; myocardial infarction

Received 15.10.2023

Revised 11.11.2023

Accepted 26.12.2023

INTRODUCTION

HIV is a progressive infection due to the destruction of the immune system largely through the depletion of CD-4 cells which leads to the state of immunodeficiency [1, 2]. Fever, which results due to cytokine-mediated effects during acute phase response caused by tissue injury or inflammation leads to rising in serum protein levels [3, 4].

C-reactive protein (CRP), an acute phase protein recognized as an important indicator of inflammatory conditions that are often the consequence of infection [5]. CRP has been found to be one of the independent tools for prognostic value in a variety of disease processes, such as atherosclerosis, renal disease, and cancer. CRP concentration and human immunodeficiency virus relation is still unclear. Lower levels of CRP have been associated to predict longer survival within HIV-infected individuals [6-8]. For a population with persisting HIV infection, the level of CRP has shown to be a relatively low level at 4 mg/L, which clears that HIV infection is a less inflammatory disease [8]. It is still unclear whether that CRP remains prognostic value for cardiovascular disease in HIV-infected people and other inflammatory diseases [9]. In the present study, we designed to find the relationship of CRP concentration between HIV disease and healthy people in order to recognize the relationship between infection and inflammation involving factors.

MATERIAL AND METHODS

A case-control study was designed between two group's healthy and infected people. Healthy people are who were not suffering from any type of disease. Cases were HIV seropositive individuals attended at ART Center of Pokhara Academy of Health Science, Pokhara, Nepal. A total of 330 participants were included in this study, out of which 110 were HIV seropositive and 220 were healthy individuals from March 2019 to March 2021. HIV infected individuals were only included as case in the study. A questionnaire was designed

to obtain the demography variables like age, sex, and ethnic group. An ethical permission was obtained from the Nepal Health Research Council (Reg. no. 89/2019) to undertake the study and the written consent were obtained from the participants who were enrolled in the study. Then, 5 ml of venous samples were collected after explaining the objective of the study from the respondent. The samples were collected in a gel tube which was centrifuged and serum was collected for CRP analysis. CRP levels were analyzed quantitatively for both groups. Levels of CRP was measured by a highly sensitive nephelometric assay using a monoclonal antibody to CRP coated on polystyrene beads with a lower limit of detection of 0.5 mg/L any turbid indicates the presence of CRP in the sample and was quantitatively measured. All obtained data were entered in Microsoft Excel 2007. SPSS version 16 was used for the analysis of data and p-value <0.005 were considered as significant.

RESULTS

This study was carried out in the ART center of the Western regional hospital of Pokhara Metropolitan city. In the case of a group, males were 51.8% and females 48.2%. Most of the case participants were of 40-60 yrs (63.6%) followed by 20-40 yrs (30%). Similarly, most of the cases were of Janajati (36.4%), Brahmin (25.5%) followed by Dalit (23.6%) and the least were others (1.8%). In the control group, males were 47.7%, and females were 52.3%. More participants from the age group 20-40 yrs (45.9%) followed by less than 20 yrs (30.5%) and then from 40-60 yrs (19.5%). Likewise, more of the control groups were from Janajati (34.5%), and Brahmin (29.1%) followed by Dalit (21.8%) and least from other ethnic groups (1.8%) as shown in **table 1**.

In this study, most of the case participants were from others than Kaski (47.3%) followed by outside Pokhara inside Kaski (41.8%), and only 10.9% from Pokhara. Maximum participants were married (95.5%) and had primary education (50%) and 22.7% of participants were illiterate. Similarly, in the control group, the maximum number of participants were from Pokhara (60.9%) followed by others than Kaski (21.4%). 54.1% of participants were married and primary education was 55.5% followed by illiterate (21.8%) and few were literate (2.3%) as shown in **table 2**.

Most of the case participants suffered from HIV through STD (94.5%) followed by syringe use (5.5%). Out of all case participants, 11.8% were intravenous syringe or drug users, 61.8% were suffering from Diabetes and 38.2% had hypertension. Most of the participants had a CD4 count of 200-600 (65.5%) followed by less than 200 (17.3%) and more than 600 (17.3%) as shown in **table 3**.

Most of the case participants were CRP positive (60%) and only 5.5% of the control participants were CRP positive as shown in **table 4**. The association of CRP with Case and control showed statistically highly significant (p-value 0.000) as shown in **table 5**. In the case group, mean \pm S.D. of age, CD4 count, and CRP values were 46.77 ± 8.65 , 423.218 ± 237.79 and 12.57 ± 14.40 respectively. Similarly, in a control group, the Mean \pm S.D. of age and CRP value were 31.05 ± 14.26 and 1.48 ± 2.18 respectively as shown in **table 6**.

Association of CRP with sex (p-value 0.139), age group (p-value 0.247), ethnic group (p-value 0.535), place of residence (p-value 0.095), marital status (p-value 0.350), level of education (p-value 0.558), intravenous or drug user (p-value 0.054), blood sugar and blood pressure (p-value 0.378), mode of transmission (p-value 0.607) and CD4 count (p-value 0.943) were statistically insignificant.

Table 1: Socio-demographic of the participants involved in the study

| Characteristic | Case (HIV=110) Frequency% | Control (Healthy People=220) Frequency% |
|---------------------|-------------------------------|--|
| Sex | | |
| Male | 57(51.8) | 105(47.7) |
| Female | 53(48.2) | 115(52.3) |
| Age Category | | |
| Less than 20 | 0 (0) | 67(30.5) |
| 20-40 | 33(30.0) | 101(45.9) |
| 40-60 | 70(63.6) | 43(19.5) |
| More than 60 | 7(6.4) | 9(4.1) |
| Ethnic Group | | |

| | | |
|---------|------------|------------|
| Brahmin | 28(25.5) | 64(29.1) |
| Chhetri | 14(12.7) | 28(12.7) |
| Janjati | 40(36.4) | 76(34.5) |
| Dalit | 26(23.6) | 48(21.8) |
| Others | 2(1.8) | 4(1.8) |
| Total | 110(100.0) | 220(100.0) |

Table 2: Current status of the participants involved in the study.

| Characteristic | Case (HIV=110) Frequency% | Control (Healthy People=220) Frequency% |
|------------------------------|-------------------------------|--|
| Place of residence | | |
| Inside Pokhara | 12(10.9) | 134(60.9) |
| Outside Pokhara inside Kaski | 46(41.8) | 39(17.7) |
| Others than Kaski | 52(47.3) | 47(21.4) |
| Marital status | | |
| Married | 105(95.5) | 119(54.1) |
| Unmarried | 5(4.5) | 101(45.9) |
| Education | | |
| Illiterate | 25(22.7) | 48(21.8) |
| Primary | 55(50.0) | 122(55.5) |
| Secondary | 23(20.9) | 45(20.5) |
| Literate | 7(6.4) | 5(2.3) |
| Total | 110(100.0) | 220(100.0) |

Table 3: HIV associated history of the participants involved in the study.

| Characteristic | Case (HIV=110) Frequency (%) | Control (Healthy People=220) Frequency (%) |
|---|---------------------------------|---|
| Mode of transmission of HIV | | |
| STD | 104(94.5) | 0 (0) |
| Syringe user | 6(5.5) | 0 (0) |
| Total | 110(100.0) | 0 (0) |
| Intravenous (syringe) or drug user | | |
| Yes | 13(11.8) | 0 (0) |
| No | 97(88.2) | 0 (0) |
| Total | 110(100.0) | 0 (0) |
| Any Cardiac Complication | | |
| Sugar | 68(61.8) | 0 (0) |
| Pressure | 42(38.2) | 0 (0) |
| Total | 110(100.0) | 0 (0) |
| CD4 Count | | |
| less than 200 | 19(17.3) | 0 (0) |
| 200 – 600 | 72(65.5) | 0 (0) |
| more than 600 | 19(17.3) | 0 (0) |
| Total | 110(100.0) | 0 (0) |

Table 4: CRP status of the participants involved in the study.

| Characteristic | Case (HIV=110) Frequency (%) | Control (Healthy People=220) Frequency (%) |
|---------------------------|---------------------------------|---|
| CRP interpretation | | |
| Positive | 66 (60.0) | 12(5.5) |
| Negative | 44 (40.0) | 208(94.5) |
| Total | 110 (100.0) | 220 (100.0) |

Table 5: Association of CRP with case and control in the study

| Case/control | CRP interpretation | | | Chi-square Value | p-value | Odds | 98% CI |
|--------------|--------------------|------------|-------------|---------------------|---------|--------|---------------------|
| | Positive | Negative | Total | | | | |
| Case | 66(60.0%) | 44(40.0%) | 110(100.0%) | 1.209 | 0.000 | 26.000 | (12.966- 52.137) |
| Control | 12(5.5%) | 208(94.5%) | 220(100.0%) | | | | |
| Total | 78(23.6%) | 252(76.4%) | 330(100.0%) | | | | |

Table 6: Analytical study of different variables in case and control.

| Descriptive Statistics | | Minimum | Maximum | Mean | Std. Deviation |
|------------------------|---------------------|---------|---------|---------|-------------------|
| Case (n=110) | Age | 28 | 71 | 46.77 | 8.651 |
| | CD4 count | 4.0 | 1440.0 | 423.218 | 237.7989 |
| | CRP value (mg/L) | 0.5 | 81.75 | 12.5757 | 14.40944 |
| Control (n=220) | Age | 12 | 65 | 31.05 | 14.268 |
| | CRP value (mg/L) | 0.50 | 11.84 | 1.4879 | 2.18173 |

DISCUSSION

C-reactive protein is of the inflammatory markers. It increases with the severity of inflammatory responses. In this study, males were 51.8% and females were 48.2% in the case group. In the control group, males were 47.7% and females were 52.3%. Maximum participants were from Janajati, Brahmin, and Dalit ethnic groups. Most of the participants were from outside of the Kaski district and outside of Pokhara but from the Kaski district in the case group. In the control group, most of them are from Pokhara city. Maximum participants had only primary-level education. The most of participants suffered from HIV through STD. Most of the participants had a CD4 count of 200-600 (65.5%) followed by less than 200 (17.3%) and more than 600 (17.3%). In this study, 60% of the case participants were CRP positive and only 5.5% of the control participants were CRP positive. The study conducted by trained et al showed that patient with HIV has increased CRP levels than HIV-negative patients [10].

In this study, the association of CRP with sex (p-value 0.139), age group (p-value 0.247), ethnic group (p-value 0.535), place of residence (p-value 0.095), marital status (p-value 0.350), level of education (p-value 0.558), intravenous or drug user (p-value 0.054), blood sugar and blood pressure (p-value 0.378), mode of transmission (p-value 0.607) and CD4 count (p-value 0.943) were statistically insignificant in the case group.

In this study, the association of CRP with Case and control showed statistically highly significant (p-value 0.000). Similarly, a study conducted by Virginia et al also showed a significant association with CRP, HIV, and myocardial infarction (p<0.0001) [11]. The study conducted by Jason et al also showed a similar type of result (p<0.001) [12]. In the case group, Mean ± S.D. of age, CD4 count, and CRP values were 46.77±8.65, 423.218±237.79 and 12.57±14.40 respectively. Similarly, in the control group, the Mean ± S.D. of age and CRP value were 31.05±14.26 and 1.48±2.18 respectively.

CONCLUSION

HIV is a serious health problem in developing countries. Its early diagnosis is important for the survival of a person. CRP is increased in the case compared to the control group so this can be an indicator of infection and inflammation which will help in the diagnosis and treatment of the diseases. So that it can aid to reduce the mortality and morbidity of infected individuals.

ACKNOWLEDGMENT

We would like to express our foremost, deepest and heartfelt gratitude to the chairman and executive Director Research Division, University Grant Commission, Sanothimi, Bhaktapur for financial support, guidance, invaluable suggestion, and constructive criticism in improving our research work.

ETHICAL CONSIDERATIONS

Ethical permission was taken from Nepal Health Research Council, Kathmandu, Nepal to conduct the study (Reg. no. 89/2019).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING SOURCE

This research project is funded by University Research Grant, Nepal under Faculty Research Grant (FRG-73/74-HS-02).

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CITATION OF THIS ARTICLE

Suresh J, Bhoopendra S, Abhisek L, Prakash K, Man Bahadur K, Ashok K S, Naval K Y. Status of C - reactive protein (CRP) in HIV Infected Individuals: A Case Control study. *Bull. Env.Pharmacol. Life Sci., Vol 13 [1] December 2023: 377-381*