

has high exposure to pesticides [11]. An investigation on the role of occupational and environmental exposures on the aetiology of acquired SAA was also performed in the UK [12]. Among the various aetiological factors associated with AA, pesticides [13-15], arsenic [16-18] and chemicals like benzene [15] have been found to be strongly linked with an increased susceptibility of individuals to develop AA. In a study, BM spicules of Megaloblastic anaemia patients were examined by electron-probe analysis to demonstrate the presence of arsenic and they showed arsenic in BM spicules [19].

A study focused on the role of organochlorine compounds, Parvovirus B19, Hepatitis viruses B and C and HIV I and II in the causation of AA in children [20]. In India, arsenic is associated with carcinoma of lungs, liver, kidney and bladder [18]. A case study has been reported from the Mumbai, focused on the AA due to heavy metal intoxication [21].

A single study had been conducted to find the association of implicative factors of this disease in the population of West Bengal. In West Bengal, pesticide-induced alterations in marrow physiology and the depletion of the stem and stromal progenitor population have been reported [22]. It is already established that West Bengal is the most arsenic affected region beside Bangladesh in the world [23]. It is necessary to have a look at the arsenic level in the AA patients of West Bengal.

A lower socioeconomic status is a risk factor for AA [24, 25]. A study has suggested and emphasized on the fact that besides host genetics, several other hemotoxic factors may contribute to an environmental aetiology of AA [26]. Evidence related to a higher association of hepatitis infection with AA is also present [27-29]. The environmental toxic exposures, pesticides were found to be strongly associated with the AA disease occurrence [15-30]. Studies report that occupational exposure to pesticides among farmers is strongly associated with all hematopoietic cancers [31].

We took the help of the questionnaire to evaluate the possible environmental and lifestyle factors. Some proven and some non-established etiological agents are included in the questionnaire. We have discussed the percentages of AA patient's exposed to different environmental factors in the results section. It was observed that most patients came from Kolkata, followed by South 24 Parganas and Murshidabad. But this may happen because we have collected samples only from Nil Ratan Sircar Medical College & Hospital. It is the only nodal centre of Haematology in eastern India. These districts are very much adjacent to the aforesaid hospital. A small number of patients were participated from the other states of eastern India, because of low awareness and knowledge about the study programme and the institutions. The 83% of AA patients belong to the very low socio-economic status being the average monthly income of the family was less than rupees 2000/-. Lack of affordability makes the whole procedure critical to the patients of haematological disorders.

Various types of occupations were found in the patients' population. Common occupations were observed to be farmer, factory worker, housewife, student, driver, government or non-government service and others. Farmers are having potential exposure to insecticide and pesticides. Relation of AA with pesticides was already documented [14]. Some of the farmers were also using the organophosphate as a pesticide which is a

potential aetiological agent of AA. Some frequently used chemicals by the AA patients are gold/silver salt, lead associated paint, paint varnish, coal-tar etc...The occupations of AA patients were also discussed. Some patients reported their occupation to be fishing and for the same, they are exposed to certain fishing related chemicals like sodium cyanide, PCBs, Rotenone, mercury chemical etc. Needless to mention some patients have reported their occupation as driving. They were being constantly exposed to the smoke of petrol and diesel due to the increased level of pollution. Few reported documentations on fishing chemicals and petrol/ diesel (both in smoke and liquid form) are present [12]. But their relation to the suppression of hematopoietic stem cell compartment is still unclear. A high percentage of patients were found to be not exposed to any known aetiological factors related to AA. This observation also support the conventional concept of AA, as in 50% cases of AA the primary aetiology is unknown and is called idiopathic aplastic anaemia [32].

Consumption of different addictive substances has been observed in patients of AA. Although no concrete reported data are found which emphasized on the pathological role of addictive substances in AA. Use of tobacco in raw (tobacco leaf), chewable (khaini, gutkha, zarda), smoking (cigarette, bidi) and powder (snuff) form were found in the patients of AA. Betel leaf and betel quid was the maximum used addictive substance. Areca nut solely or with betel leaf was also consumed at a very high percentage. Alcohol is a proven factor related to pancytopenia with cellular BM [33]. AA considerable percentage (12.94 %) of patients showed alcohol consumption. Patients participated in this study did not report for Non-A, B, C, D, E hepatitis virus, EBV, CMV, HIV infections. A more in-depth study on a large population can reveal the actual effects of the above mentioned aetiological agents.

We focused on the different types of sources of water, consumed by the AA patients for the last five years. A very small population of our society has access to purified or boiled water. The mostly used water source is shallow tube well. Source of water consumption is an important factor as groundwater is often contaminated arsenic, fluoride, pathogens, nitrate, organic compounds, metals (lead, cadmium and chromium), organohalides, petroleum hydrocarbons etc... In this study, a considerable percentage of AA patients showed arsenic count above the safe limit compared with control. Again, a high percentage of AA patients showed arsenic count above the toxicity level. Virtually only two control sample reports for the arsenic count above the toxicity level.

There are many pieces of evidence behind environmental factors can induce human cancers, telomere dysfunction, neurodegenerative diseases [34-37]. Keeping these studies in mind the data of environmental and lifestyle exposure of Fanconi anaemia patients were also collected. In a precise population, there is a likelihood of having the same nature of environmental and lifestyle factors disclosure in the patents which can lead to the mutation in the gene blamable for marrow failure. In such a consequence the children are at extraordinary risk of getting the disease. However consanguineous marriage can augment the frequency of the disease.

The present study was undertaken with a view to evaluating the role of known and unknown environmental factors and lifestyle factors of AA patients in eastern India. The findings thereafter were recorded carefully, analyzed and corroborated

in reference to the aims and objectives of this study and it was concluded environmental factors and lifestyle factors plays a profound role in the disease progression in AA patients of West Bengal. A considerable percentage of AA patients showed arsenic count above the safe limit and above the toxicity level as compared to control. Thus, it can be envisaged that arsenic toxicity can be a responsive factor in AA as West Bengal is an arsenic prone area. For the confirmation of the presence of arsenic, it's estimation from the BM sample can be performed.

Conclusion

In conclusion, it can be said probably the addiction, occupational or lifestyle exposure have a role in the disease propagation in AA patients. Of course, different types of exposure and addiction do not have the same propensity in the formation of the disease; neither will they make disease in all individuals. This observation supports the fact that every patient is coming from the different genetic background and their retention capacity and clearance of such toxic antigens are variable. This kind of lifestyle habits should be immediately terminated after the disease diagnosis as it can make the disease more complex. Simultaneously the patients should be counselled for the probable risk. Further studies are needed to come to any definite conclusion.

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Disclosure of conflict of interest

None.

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