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# Prevalence of anaemia and hypoalbuminemia in newly diagnosed carcinoma cases: a real world experience

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**Abstract**

**Introduction:** Anaemia is prevalent in nearly 30-90% cases of newly diagnosed malignancy (1). Prevalence of anaemia in cancer involves multiple pathways e.g., malnutrition, blood loss, reduced Erythropoietin production, release of several cytokines, iron sequestration by increased hepcidin or by bone marrow infiltration. Even non anaemic patients may develop anaemia during the treatment phase. It may lead to inadvertent delay in starting management for the cancer proper. Not only the delay in starting the treatment, indirectly it leads to tumour hypoxia which again causes inherent resistance to both radiotherapy and chemotherapy. Similar to anaemia prevalent in cancer patients, low albumin level is another concern as it is considered a part of nutritional assessment as well as an independent prognostic factor in several carcinomas. Prevalence of anaemia and hypoalbuminemia in carcinoma is often underreported especially in the backdrop of a cohort of socio economically backward patient population. We report the same as a part of retrospective audit to formulate policy for management of the future patients.

**Method:** This study was undertaken in Sri Ramakrishna Institute of Medical Sciences and Sanaka Hospital situated in West Bengal, INDIA which specially caters to a large part of rural Bengal population with socio economically backward class. As a part of hospital policy for any newly admitted patient complete blood count, renal function test and liver function tests are performed. Haematological and biochemical data of newly diagnosed carcinoma (histopathologically proven malignancy) are pooled retrospectively from an electronic database of SRIMS & SH from August 2022 to August 2023.

**Results:** Demographic details: A total record of 303 patients is captured. In this cohort, Lung and hepatopancreaticobiliary group comprise the largest cancer groups (14.2 % each) followed by breast and head and neck (13.2% each).

**Prevalence of anaemia:** Median haemoglobin level is 9.8 gm % (IQR 8.3-11.3gm %). Mean haemoglobin level was 9.81 +/- 2.05 gm% (range: 3.4-15.1).Mean Trigger value for transfusion is

7.85 gm% +/- 1.11 gm%. Bivariate analysis revealed anaemia has significant association with performance status, site of primary carcinoma, stage of disease.

**Prevalence of hypoalbuminemia:** Considering albumin less than 3.5 mg/dl as hypoalbuminemia, it is found in 112 cases (36.9%). 16.8 % cases have albumin level less than 3 mg/dl. Median albumin level was 3.7 mg/dl (IQR 3.2-4.0 mg/dl) among all patients whereas in hypoalbuminemia, patients mean albumin level was 2.98 +/- 0.39 mg/dl.

**Conclusion:** From this study as a policy change, investigations for types of anaemia and albumin as well as early proactive rectification by corrective measures has been imbibed as a part of cancer management.

## Introduction:

Anaemia is prevalent in nearly 30-90% cases of newly diagnosed malignancy (1). Prevalence of anaemia in cancer involves multiple pathways e.g., malnutrition, blood loss, reduced Erythropoietin production, release of several cytokines, iron sequestration by increased hepcidin or by bone marrow infiltration. Even non anaemic patients may develop anaemia during the treatment phase. It may lead to inadvertent delay in starting management for the cancer proper. Not only the delay in starting the treatment, indirectly it leads to tumour hypoxia which again causes inherent resistance to both radiotherapy and chemotherapy. (2) Overall it compromises quality of life and survival. It remains a challenging factor and it always warrants therapy for anaemia correction. Moreover in the case of moderate to severe anaemia requiring blood transfusion, lack of availability is the most critical factor. According to the WHO database, Irrespective of disease, anaemia is more prevalent in African countries and Asian countries. (3) Causal factors are mostly dietary iron deficiency, haemolytic anaemia or haemoglobinopathies or infectious disease. (4) Like anaemia prevalent in cancer patients, low albumin level is another concern as it is considered a part of nutritional assessment as well as an independent prognostic factor in several carcinomas. (5, 6) Anorexia leading to low protein intake and systemic inflammatory responses found in carcinoma are two leading reasons.(7) In literature, It is typically associated with a high mortality rate (13-34%) in hospitalized patients.(8) Prevalence of anaemia and hypoalbuminemia in carcinoma is often underreported especially in the backdrop of a cohort of socio economically backward patient population. We report the same as a part of retrospective audit to formulate policy for management of the future patients.

## Method:

This study was undertaken in Sri Ramakrishna Institute of Medical Sciences and Sanaka Hospital situated in West Bengal, India which specially caters to a large part of rural Bengal population with socio economically backward class. As a part of hospital policy for any newly admitted patients Complete blood count, renal function test and liver function tests are performed. Haematological and biochemical data of newly diagnosed carcinoma (histopathologically proven malignancy) are pooled retrospectively from an electronic database of SRIMS & SH from August 2022 to August 2023. Any patient having earlier cancer treatment who may have chemotherapy induced anaemia (CIA) is excluded from the database. All patients are admitted for investigations, thus all reports are uniformly done in their own hospital laboratories (NABL accredited). Complete blood counts have been done in 5 part automated haematology analyser SYSMEX XS 500I and Albumin is measured as a part of liver function test by fully automated biochemistry analyser SYS 400. In case any discrepancy data is double checked by the same pathologist (AC) and same biochemist (SC). Anaemia is defined as Hb less than 11 mg/dl whereas normal albumin level is defined as 3.5 mg/dl or more than 3.5 mg/dl. This entire retrospective data was collected to formulate hospital-based

policy to systematically address the problem of anaemia in newly diagnosed neoplasia cases. The data has been collected and cleaned by AD and SG. It has been analysed in SPSS. Chi square and Odds ratio has been calculated to check for association and correlation.

**Results:**

**Demographic details:**

A total record of 303 patients is captured. Socio demographic data are analysed as a part of study (**Table 1**). Majority are female patients (162, 53.5%). Median age group in the entire patient population is 56 years (IQR: 47-63 years). 50.8% of patients belonged to the 50-64 age group followed by 24.1 % in the 35-49 age group. In this cohort, Lung and hepatopancreaticobiliary group comprise the largest cancer groups (14.2 % each) followed by breast and head and neck (13.2% each). Major patient population (218, 71.9 %) has performance status 1. 8.3% patients have poor performance status 3. 70% of patients belong to rural areas followed by 15.2 % patients from semi urban areas. Nearly all of them (>99%) belong to poor socioeconomic backgrounds and received all kinds of investigation and treatment under state government schemes. A large number of patients (171, 56.4%) are diagnosed in stage IV.

**Prevalence of anaemia**:

Median haemoglobin level is 9.8 gm % (IQR 8.3-11.3gm %). Mean haemoglobin level was 9.81 +/- 2.05 gm% (range: 3.4-15.1). **(Table 2**) Commonest grade is moderate anaemia found in 94 (31%) patients. Median MCV and MCHC are 81.7 (75.1-88.4%) and 26 (23.2-28.3). 26.7% patients presented with normocytic normochromic anaemia. 44.9% patients presented with microcytic anaemia out of which 65.4 % presented with microcytic hypochromic anaemia. (Figure 1) Most uncommon is macrocytic anaemia (1.9%). Mean Trigger value for transfusion is 7.85 gm% +/- 1.11 gm%. At least 121 patients received blood transfusion and iron supplementation before starting oncology directed therapy. Female group of patients (72.2%) and younger age group (75%) had higher incidence of anaemia. Hepatopancreatobiliary group and lymphoma has the highest prevalence of anaemia (85.7-86%). Stage IV irrespective of site is the worst hit with anaemia (80.7%). Bivariate analysis revealed anaemia has significant association with performance status, site of primary carcinoma, stage of disease. When multivariate analysis was conducted no typical association has been found between prevalence of anaemia and other variables. (**TABLE 3).** This may be attributable to prior malnutrition before diagnosis of disease.

**Prevalence of hypoalbuminemia:**

Considering albumin less than 3.5 mg/dl as hypoalbuminemia, it is found in 112 cases (36.9%). 16.8 % cases have albumin level less than 3 gm/dl. Median albumin level was 3.7 mg/dl (IQR 3.2-4.0 mg/dl) among all patients whereas in hypoalbuminemia, patients mean albumin level was 2.98 +/- 0.39 mg/dl. PS is directly correlated with Hypoalbuminemia (for PS 2, OR=2.283, CI 1.159 - 4.496, P= 0.017 & for PS 3, OR= 3.662, CI 1.299 -10.323, P= 0.014). Site wise Head and neck carcinoma are more prone to develop hypoalbuminemia (OR= 4.426, CI 1.178-16.635, P= 4.426). (**Table 4)**

**TABLE 1:**

| **Variables** | **Frequency (n)** | **Percentage (%)** |
|---|---|---|
| **Sex** | | |
| Male | 141 | 46.5 |
| Female | 162 | 53.5 |

| | | |
|---|---|---|
| **PS** | | |
| 1 | 219 | 72.3 |
| 2 | 59 | 19.5 |
| 3 | 25 | 8.3 |
| **Area** | | |
| Urban | 212 | 70 |
| Semi urban | 46 | 15.2 |
| Rural | 45 | 14.9 |
| **Age group** | | |
| 18-34 | 16 | 5.6 |
| 35-49 | 73 | 24.1 |
| 50-64 | 154 | 50.8 |
| >65 | 60 | 19.8 |
| **Site** | | |
| Breast | 40 | 13.2 |
| Haemat | 7 | 2.3 |
| HPB | 43 | 14.2 |
| UGI | 17 | 5.6 |
| Uro | 21 | 6.9 |
| Lung | 43 | 14.2 |
| Gynae | 31 | 10.2 |
| HN | 40 | 13.2 |
| Colorectal | 25 | 8.3 |
| Others | 36 | 11.9 |
| **STAGE** | | |
| I | 9 | 3 |
| II | 36 | 11.9 |
| III | 77 | 25.4 |
| IV | 171 | 56.4 |
| UNKNOWN | 10 | 3.3 |

**TABLE 2:**

| FACTORS | NO | HB (gm/dl) Mean +/- SD | MEDIAN | Range (gm/dl) | ANAEMIA |
|---|---|---|---|---|---|
| SEX | | | | | |
| M | 141 (46.5%) | 9.83 +/-2.3 | 9.7 | 3.6-15.1 | 66 |
| F | 162 (53.5%) | 9.8 +/-1.82 | 10 | 3.4-15 | 72.2 |
| AGE GROUP | | | | | |
| 18-34 | 16 (5.3%) | 8.95 +/- 2.51 | 8.9 | 3.6-12.7 | 75 |
| >34 - 49 | 73 (24.1%) | 9.95 +/- 1.88 | 9.8 | 5.9-14.7 | 69.9 |
| >49 – 65 | 154 (50.8%) | 9.95 +/- 2.07 | 10 | 3.4-15.1 | 68.8 |
| >65 | 60 (19.8%) | 9.53 +/- 2.05 | 9.35 | 5.7-13.1 | 68.3 |

| SITES | | | | | |
|---|---|---|---|---|---|
| BREAST | 40 ( 13.2) | 10.5 +/- 1.63 | 10.6 | 6.8-15 | 57.5 |
| LYMPHOMA | 7 ( 2.3) | 8.76 +/-1.92 | 9.2 | 5.8-11.3 | 85.7 |
| HPB | 43 ( 14.2) | 8.7 +/- 2.21 | 8.3 | 3.4-13.70 | 86 |
| UPPER GI | 17 ( 5.6) | 9.91 +/- 2.02 | 10.2 | 7.1-14.2 | 70.6 |
| UROLOGY | 21 ( 6.9) | 10.54 +/-1.35 | 10.6 | 7.8-13.1 | 57.1 |
| LUNG | 43 ( 14.2) | 9.63 +/- 1.99 | 9.4 | 6.7-13.2 | 76.7 |
| GYNAE | 31 ( 10.2) | 10 +/-1.49 | 10.2 | 6.8-12.3 | 71 |
| HN | 40 ( 13.2) | 10.9 +/- 1.99 | 11.15 | 5.7-14.7 | 47.5 |
| OTHERS | 36 ( 11.9) | 9.31 +/- 2.36 | 9.2 | 5.5-15.1 | 72.2 |
| COLORECTAL | 25 ( 8.3) | 9.24 +/- 1.95 | 9.5 | 3.6-12.3 | 80 |
| PS | | | | | |
| PS 1 | 219 (72.3) | 10.3 +/- 1.78 | 10.2 | 5.8-15.1 | 63.5 |
| PS 2 | 59 (19.5) | 9.15 +/- 2.09 | 9 | 5.7-14.7 | 83.1 |
| PS 3 | 25 (8.3) | 7.67+/- 2.47 | 7.6 | 3.4-12.6 | 88 |
| STAGE | | | | | |
| I | 9 (3 ) | 11.4 +/- 1.21 | 10.8 | 9.9-13.4 | 55.6 |
| II | 36 (11.9) | 10.19 +/- 1.87 | 10.75 | 4.1-13.1 | 58.3 |
| III | 77 (25.4) | 10.66 +/- 1.95 | 10.8 | 3.6-15 | 51.9 |
| IV | 171 (56.4) | 9.31 +/- 1.95 | 9.2 | 3.4-15.1 | 80.7 |
| UNAVAILABLE | 10 (3.3) | 9.45 +/- 2.45 | 9.45 | 5.9-12.9 | 60 |

| | | CHROMIC | | |
|---|---|---|---|---|
| | | <32 | 32-36 | >36 |
| | | Row N % | Row N % | Row N % |
| CYTIC | <80 | 65.4% | 34.6% | 0.0% |
| | 80-100 | 49.7% | 50.3% | 0.0% |
| | >100 | 50.0% | 50.0% | 0.0% |

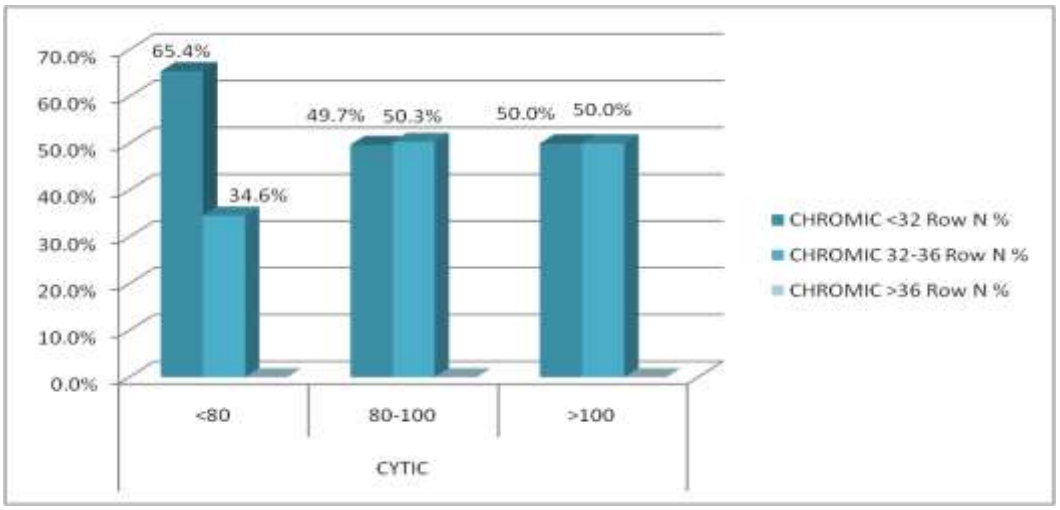


*Figure 1*

**Table 3**

| VARIABLES | ANAEMIA (n,%) | NO ANAEMIA (n,%) | Odds ratio | P VALUE |
|---|---|---|---|---|
| **PS 1** | 139 (45.8) | 80 (26.4) | 1 | 0.062 |
| **PS 2** | 49 (16.2) | 10 (3.3) | 0.485 | 0.084 |
| **PS 3** | 22 (7) | 3 (0.01) | 0.282 | 0.071 |
| **AGE GROUP** | | | | |
| **18-34** | 12 (3.9) | 4 (1.3) | 1 | 0.935 |
| **>34 - 49** | 51 (16.8) | 22 (7) | 1.304 | 0.708 |
| **>49 - 65** | 106 (34.9) | 48 (15.8) | 1.329 | 0.676 |
| **>65** | 41 (13.5) | 19 (6.2) | 1.565 | 0.542 |
| **SITES** | | | | |
| **BREAST** | 23 (7.6) | 17 (5.6) | 1 | 0.091 |
| **LYMPHOMA** | 6 (1.9) | 1 (0.003) | 0.144 | 0.108 |
| **HPB** | 37 (12.2) | 6 (1.9) | 0.567 | 0.37 |
| **UPPER GI** | 12 (3.9) | 5 (1.6) | 0.528 | 0.378 |
| **UROLOGY** | 12 (3.9) | 9 (2.9) | 1.434 | 0.624 |
| **LUNG** | 33 (10.89) | 10 (3.3) | 0.597 | 0.402 |
| **GYNAE** | 22 (7.2) | 9 (2.9) | 0.464 | 0.177 |
| **HN** | 19 (6.14) | 21 (6.9) | 1.540 | 0.455 |
| **OTHERS** | 26 (8.5) | 10 (3.3) | 0.431 | 0.22 |
| **COLORECTAL** | 20 (6.6) | 5 (1.6) | 0.321 | 0.088 |
| **SEX** | | | | |
| **F** | 117 (38.6) | 45 14.85) | 1 | |
| **M** | 93 (30.6) | 48 (15.84) | 1.461 | 0.317 |
| **STAGE GROUP** | | | | |
| **I** | 5 (1.6) | 4 (1.3) | 1 | 0.005 |
| **II** | 21 (6.9) | 15 (4.9) | 0.711 | 0.742 |
| **III** | 40 (13.2) | 37 (12.2) | 0.715 | 0.717 |
| **IV** | 138 (45.54) | 33 (10.9) | 0.734 | 0.725 |
| **UNAVAILABLE** | 6 (1.9) | 4 (1.3) | 0.218 | 0.075 |

**Table 4**

| VARIABLES | HYPOALBUMINEMIA (n,%) | NO HYPOALBUMINEMIA (n,%) | Odds ratio | P VALUE |
|---|---|---|---|---|
| **PS 1** | 62 (20.4) | 157 (5.2) | 1 | .007 |
| **PS 2** | 33 (10.89) | 26 (8.5) | 2.283 | .017 |
| **PS 3** | 17 (5.6) | 8 (2.6) | 3.662 | .014 |
| **AGE GROUP** | | | | |
| **18-34** | 6 (1.9) | 10 (3.3) | 1 | 0.960 |
| **>34 - 49** | 26 (8.5) | 47 (15.5) | 0.932 | 0.918 |
| **>49 - 65** | 54 (17.8) | 100 (33) | 0.851 | 0.806 |
| **>65** | 26 (8.5) | 34 (11.2) | 1.021 | 0.977 |
| **SEX** | | | | |
| **F** | 101 (33.3) | 61 (20.1) | 1 | |
| **M** | 90 (29.7) | 51 (16.8) | 0.888 | 0.733 |
| **SITES** | | | | |
| **BREAST** | 8 (2.6) | 32 (10.5) | 1 | .028 |
| **LYMPHOMA** | 2 (0.06) | 5 (1.6) | 2.623 | .351 |
| **HPB** | 27 (8.9) | 16 (5.2) | 2.993 | .060 |
| **UPPER GI** | 8 (2.6) | 9 (2.9) | 3.230 | .112 |
| **UROLOGY** | 6 (1.9) | 15 (4.9) | .913 | .908 |
| **LUNG** | 19 (6.27) | 24 (7.9) | 2.015 | .250 |
| **GYNAE** | 10 (3.3) | 21 (6.9) | 3.260 | .062 |
| **HN** | 6 (1.9) | 34 (11.2) | .602 | .466 |
| **OTHERS** | 15 (4.9) | 21 (6.9) | 4.426 | .028 |
| **COLORECTAL** | 11 (3.6) | 14 (4.6) | 3.003 | .090 |
| **STAGE GROUP** | | | | |
| **I** | 7 (2.3) | 2 (0.006) | 1 | .001 |
| **II** | 31 (10.2) | 5 (1.6) | 4.728 | .262 |
| **III** | 61 (20.1) | 16 (5.3) | 3.023 | .387 |
| **IV** | 83 (27.4) | 88 (2.9) | 6.371 | .124 |
| **UNAVAILABLE** | 1 | 9 (2.9) | 18.065 | .013 |

**Discussion:**

Anaemia is a major public health concern. In 2004 European Cancer Anaemia Survey (9) reported prevalence of anaemia in 39.3% (Hb less than 10 gm/dl) and in 2005 ACAS (10) reported a similar rate of 35% prevalence of anaemia. Compared to another report from southwest China (11), (18.98%) Our study reported an overwhelming high prevalence of anaemia 69.3 % (Hb less than 11 mg/dl). Nearly similar rates (44.1%) have been reported in Saudi Arabia. (12)

Commonest site of carcinoma having anaemia varies across the studies and does not bear any correlation except bleeding history bears a certain correlation with anaemia. (13) Gynaecological cancers and urogenital cancers have the highest prevalence and this is likely due to bleeding associated with this malignancy. However, in our study the most common site is hepatopancreatobiliary carcinoma (of which majority are carcinoma gall bladder in advanced stages). A European cancer anaemia survey also revealed the highest rate among pancreatic carcinoma (63.2%). (9) Delayed presentation and advanced disease may explain such high prevalence of anaemia. Lymphoma remains the second commonest malignancy with anaemia.

As quoted in ACAS, the mean trigger for blood transfusion was 9.5 gm/dl which was again comparable to our report. Microcytic hypochromic anaemia is commonly found in this study population which mostly refers to iron deficiency anaemia (micronutrient deficiency). WHO report, ECAS and other studies showed similar rates. (14)

Prevalence of low albumin in cancer has been always assessed against outcome and survival pattern. However, problem statement of low albumin is rarely made. The Turkish descriptive oncology research group reported a cut off value of 3.11 mg/dl below which there was poor response against chemotherapy. (15) In our study almost one-third patients had albumin level less than 3.5 gm/dl. Specifically some series with head neck carcinoma have worse survival.(16) Our study too revealed a higher risk pattern in head and neck carcinoma.

This study being a retrospective study has its own nuances. Iron store status and TIBC data are not routinely done, thus are not available. Some other relevant data for analysis like CRP are missing. Survival data are yet to be collated. However, the addition of those data would have been better correlated.

**Conclusion:**

From this study as a policy change, investigations for types of anaemia and albumin as well as early proactive rectification by corrective measures has been imbibed as a part of cancer management.

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