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ORGINAL ARTICLE

Prognostic Assessment of Body Mass Index in Acute Myeloid Leukemia Patients Receiving Induction Chemotherapy

Ayman Fareed Saad AL-Awady ,Ayman Fathy Abd-Alhalim and Elsayed Anany Metwally
Internal Medicine, Department, Faculty of Medicine – Zagazig University, Egypt .

CorrespondingAuthor:
Name: Ayman Fareed Saad AL-Awady
Email: dd44dd71@yahoo.com

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ABSTRACT

Background: Acute leukemia is considered as the most popular hematological neoplasm, reflected bypresenceof precursor cells of malignant clone in peripheral circulation and bone marrow. **Objectives**: Our survey was done to evaluate the role of new prognostic factors as body mass index in adult patients receiving induction chemotherapy for acute myeloid leukemia. **Patients and Methods**: this study was carried out during the period from February 2018 to February 2019 in Clinical Hematology Unit, Internal Medicine Department of Zagazig University Hospitals. The study is Cross sectional of total subjects included 80 patients who were diagnosed as acute leukemia; 28 of them were females and 56 were males. Body mass index (BMI) is defined as the summation of division of weight calculated in kilograms by the square of height calculated in meters (kg/m^2). **Results**: We found a statistically significant difference between the overweight patients and underweight patients regarding primary induction failure (PIF) rates. There is an increase in rates of PIF in the group of underweight patients than overweight group. Patients whom BMI is more than 25 can carry better results than underweight patients whom BMI < 25 as regarding to induction chemotherapy outcomes and overall survival, it may be due to increased period of chemotherapy distribution through the obese patients body with low rates of drug clearance. Sensitivity and specificity of BMI as a predictor for detection of response was calculated under cut-off range. There was an increase in rates of death rates in the group of underweight patients than overweight group. In addition to Disseminated intravascular coagulation was more frequently observed in the underweight group as compared to the normal and overweight groups. BMI level cutoff > 26.4 the sensitivity was 75 % and specificity was 66.67 % and Sensitivity and specificity of BMI as a predictor for detection of primary induction failure was calculated with cut-off range ≤28.7 , the sensitivity was 83.33% and specificity was 49.02% . and specificity of BMI as a predictor for detection of death was calculated ≤ 26.6 , the sensitivity was 90.91 % and specificity was 59.42 %. **Conclusions:** Evaluation of BMI in acute myeloid leukemia patients before starting chemotherapy is is a respectable prognostic markers in assuming consequences in adult patients on induction chemotherapy.

Keywords: Body Mass Index, Acute Myeloid Leukemia, Prognostic Factor

INTRODUCTION

Acute myeloid leukemia is considered as the most popular hematological neoplasm, reflected bypresenceof precursor cells of malignant clone in peripheral circulation and bone marrow. Induction treatment is high dose chemotherapy formed of dunorubicinin or idarubicine combination with cytarabine, and it hadn't been changed through last 30 years [1]. Patients of Acute Leukemia, induction chemotherapy is high risk process. Many hazardsup to dangerous morbidity and even death [2].Complications can occur while debulking of the malignancy. Risky bleeding tendency and infectious complications are significant drawbacks due to decrease in platelet count and infectious complications resulting from the immune-compromised [3].Previous studies have informed high rates of mortality of induction chemotherapy treatment of newly diagnosed Acute Leukemia patients [4].

As regard to Body mass index (BMI), it is defined as the summation of division of weight - calculated in kilograms- by the square of height - calculated in meters- (kg/m2). Also BMIcan be considered as real indicator to detect weight distributed in the body .As it focuses on calculation of overweight not fat[5]. BMI is a

simply calculated with cheap resources and without harming patients. Not like used techniques, BMI merely depends on weight and height and patients can assess their BMI with reasonable accuracy and totally simple tools [6]. Acute leukemia is the most common malignancy which treatment is extremely specialized in the developed countries. In spite of the fact that there are numerous territorial cancer centers, exceptionally few patients have get to to such standard specialized treatment. The reasons for this are moo financial status, and the money related burden of chemotherapy [7]. In acute leukemia typical hematopoiesis is supplanted by irregular development and dysregulated expansion of leukocytes Coupled with noteworthy bone marrow invasion, this leads to diminished generation of ordinary granulocytes coming about in neutropenia and impeded granulocyte work. Furthermore, the nearness of a huge number of youthful myeloid cells can restrain antigen particular Tcell reaction. In this manner, recently analyzed leukemia patients regularly display with concurrent diseases [8]. Immunocompromised patients, such as those analyzed with malignancies and accepting chemotherapy, are at indeed higher hazard of neutropenia and resultant contaminations. These more often than not emerge amid the primary course of accepting chemotherapy, and are straightforwardly corresponding to the term and seriousness of the neutropenia. Such complications require early and provoke start of antimicrobial treatment and more request for steady treatment in an ICU setting [9].

This reason explains later American Society of Clinical Oncology (ASCO) recommendations not to decrease chemotherapy doses given to obese persons. Actually, long or short term toxicity raises between overweight patients having full weight based chemotherapy doses haven't been proven yet. Moreover, a recent systematic review comparing outcomes and toxicities of normal weight versus obese patients on chemotherapy dosed based on actual body weight (ABW) deduced that about 3/4 toxicities were reduced in the obese population, whereas survival did not differ [10]. We have no information on the weights of our subjects earlier to their AML diagnosis. Patients who displayed as underweight at conclusion included those who were ordinarily underweight, those who were malnourished, and those who had as of now experienced cancer-related weight misfortune or cachexia which may be related with poorer results and infection movement [11]. Therefore, the aim of our study is to assess role of body mass index as prognostic factor in acute myeloid leukemia patients receiving chemotherapy and compare the results with other prognostic factors.

PATIENTS AND METHODS

This study had been performed in the period from February 2018 to February 2019 in Internal Medicine Department, Clinical Hematology Unit, and Zagazig University Hospitals. This is a Cross sectional study of total subjects included 80 patients who were diagnosed as acute leukemia; 28 of them were females and 56 were males .Body mass index (BMI) is defined as the summation of division of weight calculated in kilograms by the square of height calculated in meters (kg/m2). (Group I) were underweight whom BMI < 25 and were 32 and (Group II) were overweight and their BMI > 25 and were 48.Inclusion criteria were Age above 18 years old, Both sexes are eligible, Chemotherapy naïve and P.S 0-1 Exclusion of previous exposure to chemotherapypatients, positive HIV patients, patients whodiagnosed as AML M3, patients whotreated with other than the standard induction chemotherapy, (non-anthracycline based induction).

Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

After taking approval of Institutional Review Board (IRB),The study was carried out according to the declaration of Helsinki guidelines. All patients included in our study were asked about detailed history taking with special considerations for age, sex, smoking, co-morbidities and medications and were subjected to physical examination, routine and special laboratory investigations as Complete blood picture (CBC) measured by automated blood counter, blood film to detect number of blast cells in peripheral blood, Liver function tests: serum bilirubin (total and direct), serum albumin, serum alanine transaminase and aspartate transferase using automated analyzer “Dimension RxL Max”.Kidney function tests: serum creatinine, serum urea using automated analyzer “Dimension RxL Max”.LDH: by homogeneous enzymatic colorimetric test using automated analyzer “Dimension RxL Max”.ESR: was performed

using westergreen tubes, Cultures (blood & urine &sputum), HCV antibody and HBsAg and HIVby third generation enzyme-linked immune sorbent assay (ELISA), bone marrow aspiration, flow cytometry, cytogenetic analysis, ultrasonography, chest X-ray, echocardiography were done to all exanimated subjects in zagazig university hospitals.

At the starting point of induction chemotherapy we calculated weights and heights of the patients.For BMI: BMI (kg/m2) = weight (kg)/height (m2). World Health Organization (WHO) divided categories of BMI to 4 sections. Section of Underweight patients whom BMI strictly under 18.5,Section of normal weight patientswho has BMI among 18.5 and 25 , group of overweight whose BMI ranging from 25 to 30, and finally obese patients with BMI over 30 kg/m2. BSA (m2) had been calculated using formula of the Dubois and Dubois: 0.007184 × height (cm0.725) × weight (kg0.425). All patients received induction chemotherapy composed of Induction (or remission induction) and Consolidation (intensification).For Patients with AML. They will receive induction chemotherapy which is composed of continuous intra venous injection of cytarabine 100 mg/m2/day for 7 consecutive days with intra venous injection of Doxorubicin 25mg/m2/day D1 to D3 consecutively. Follow up patients 21 to 28 days andidentify high risk group to continue either another cycle of induction and be sent for BMT if they have donorsimultaneously or to start consolidation by high dose ARA-C with dose of 1gm/m2 every 12hrs at D1, D3, D5. Follow up patients for one year to detect results of our study.

STATISTICAL ANALYSIS

Using SPSS program of SPSS (Statistical Package for Social Science) version number**20**for windows (SPSS Inc., Chicago, IL, USA) &MedCalc 13 for Windows (MedCalc Software bvba, Ostend, Belgium), wecould computerize and analyze statistically data were collected. By the Kolmogorov–Smirnov test, Data had been tested for detecting normal distribution. Qualitative data had been expressed as percentage and frequency.To assess difference between variables ofqualitative data we had used Chi square test ($\chi 2$) and Fisher exact. Mean ± SD (Standard deviation)were used to represent Quantitative data. Assessingchanges between quantitative variablesthrough two sections in normally distributed data, Independent T test was performed. Also we express amounts nearby(1) as considerable correlation &amounts nearby(0) as weakened correlation.All statistical comparisons were two tailed with significance Level of P-value ≤ 0.05 shows significance, p <0.001 means extremely significant difference while, P> 0.05 means No significance for difference, (ROC) curve done for selection of highly values of results of test and to distinguish between different strategies of tests.Determination of Areas under ROC curve and its standard defaults bymethods ofCentro, and compared by using of normal distribution, along with correction of observational correlations obtained from the cases.Assessment of area under a ROC curve (AUC) values shows: 0.90 – 1 means excellent, 0.80-0.90 means good, 0.70-0.80 means fair; 0.60-0.70means poor; and 0.50-0.6 means fail. The optimal point of cutoff was marked at the maximum accuracy point. All tests had two sectors .Value of $p < 0.05$ was counted as statistically significant (S) while, value of $p < 0.001$ was extremely statistically significant (HS). Finally, value of $p \geq 0.05$ was treated as non - statistically significant (NS).All statistical comparisons were two tailed, with a P value of < 0.05 as statistical significance.

RESULTS

The obtained results in **Table (1)** showed the mean ± SD of age 44±15.5, with significant P value =0.015. The number of male patients was 52 (65%) while the number of female patients was 28 (35%). The number of patients whose PS was zero was 60 while the number of patients had PS 1 and 2 was 20. As well, Patients whom BMI was less than 25 had distinguished with their mean length :178.7 as compared to overweight whose mean length was 166.4, while Patients whom BMI was more than 25 had distinguished with their mean weight 82,5 as compared to Patients whom BMI was less than 25 whose mean weight was 65.2 **(Table 1)**.

Concerning clinico-demographic data of diseases history, symptoms and signs as described in **Table (2)**. Overweight patients had prevalence of chronic diseases as Diabetes and Hypertension, while to presenting symptoms (anemia, infection, bleeding, gum swelling) were common in patients with low BMI. The data of outcomes in **Table (3)** showed a significant increase in rates of remission in overweight group with significant $p < 0.01$ while rates of PIF, ED, were higher in group of low BMI.

Regarding risk factors on remission rates, there was an Increasd rates of remission between non smokers, HCV, overweight, good PS, favorable and intermediate cytogenetics patients as shown in **Table (4)**. The attainable results showed that, there was no staistically significant

difference in the laboratory finding including: CBC, blood film, inflammatory markers and initial BM blasts as described in **Table (5)**.

The results of univariete analysis, after adjusting for age, gender, co morbidities , cytogenetics , BMI showed HR 1.58 and 95% confidence interval (CI) 1.10–2.27, p < 0.012) moreover, in multivariate analysis BMI showed HR 1.61 and 95% confidence interval (CI) 1.09 – 2.38, p< 0.013). Unfavorable cytogenetics showed the highest HR with Intermediate group as shown in **Table (6)**.

Concerning cut off levels of BMI in predicting of CR , PIF , ED as shown in **Table (7)**. At Body mass index cut off >26.4 as regards Complete remission , the sensitivity was 75% and specificity was 66.67 %. At BMI cut off ≤28.7 as regards primary induction failure , the sensitivity was 83.33% and specificity was 49.02% . At BMI cut off ≤ 26.6 as regards Early death , the sensitivity was 90.91% and specificity was 59.42 %.

Table (1): **Clinico-demographic data of the studied population (N= 80)**

		Body mass index		Total	P
		<25Kg/m2	≥25Kg/m2		
		N=32	N=48	N=80	
Age	**Mean±SD**	49.3 ± 16.3	40.5 ± 14	44 ± 15.5	0.015
Sex	**Female**	11 (34.4%)	17 (35.4%)	28 (35.0%)	0.924
	Male	21 (65.6%)	31 (64.6%)	52 (65.0%)	
PS	**0**	21 (65.6%)	39 (81.3%)	60 (75.0%)	0.184
	1	10 (31.3%)	9 (18.8%)	19 (23.8%)	
	2	1 (3.1%)	0 (0.0%)	1 (1.3%)	
WT (Kg)		65.2 ± 7.1	82.5 ± 11.9	75.6 ± 13.3	<0.001
HT (Cm)		178.7 ± 7.1	166.4 ± 10.1	171.3 ± 10.8	<0.001
BMI		20.4 ± 2.1	29.7 ± 2.4	26 ± 5.1	<0.001
SA (m2)		2.1 ± 0.1	2.3 ± 0.2	2.2 ± 0.2	<0.001

Table (2): Clinico-demographic data of diseases history, symptoms and signs

Hx		Body mass index		Total	P
		<25Kg/m2 N=32	≥25Kg/m2 N=48	N=80	
Smoking	**N**	29 (90.6%)	43 (89.6%)	72 (90.0%)	0.879
	Y	3 (9.4%)	5 (10.4%)	8 (10.0%)	
Anemic Symptoms	**N**	21 (65.6%)	21 (43.8%)	42 (52.5%)	0.055
	Y	11 (34.4%)	27 (56.3%)	38 (47.5%)	
Bleeding	**N**	22 (68.8%)	37 (77.1%)	59 (73.8%)	0.407
	Y	10 (31.3%)	11 (22.9%)	21 (26.3%)	
Persistent Infection	**N**	23 (71.9%)	40 (83.3%)	63 (78.8%)	0.22
	Y	9 (28.1%)	8 (16.7%)	17 (21.3%)	
Gum Swelling	**N**	27 (84.4%)	41 (85.4%)	68 (85.0%)	0.898
	Y	5 (15.6%)	7 (14.6%)	12 (15.0%)	
LN	**N**	25 (78.1%)	37 (77.1%)	62 (77.5%)	0.913
	Y	7 (21.9%)	11 (22.9%)	18 (22.5%)	
Hx Of Cancer	**N**	28 (87.5%)	47 (97.9%)	75 (93.8%)	0.059

Hx		Body mass index <25Kg/m2 N=32	Body mass index ≥25Kg/m2 N=48	Total N=80	P
	Y	4 (12.5%)	1 (2.1%)	5 (6.3%)	
DM	N	30 (91.3%)	36 (75 %)	68 (85.0%)	0.443
	Y	2 (9.7%)	12 (25 %)	12 (15.0%)	
HTN	N	26 (81.3%)	36 (75 %)	67 (83.8%)	0.621
	Y	6 (18.8%)	12 (25 %)	13 (16.3%)	

Table (3):Clinico-demographic data of Outcome.

Outcome		Body mass index <25Kg/m2 N=32	Body mass index ≥25Kg/m2 N=48	Total N=80	P
Remission	2ndICR	4 (12.5%)	3 (6.3%)	7 (8.8%)	**0.01**
	Cr	11 (34.4%)	33 (68.8%)	44 (55.0%)	
	No Cr	17 (53.1%)	12 (25.0%)	29 (36.3%)	
Primary induction failure	..	7 (21.9%)	4 (8.3%)	11 (13.8%)	**0.034**
	No	15 (46.9%)	36 (75.0%)	51 (63.8%)	
	Yes	10 (31.3%)	8 (16.7%)	18 (22.5%)	
Early death	No	25 (78.1%)	44 (91.7%)	69 (86.3%)	0.083
	Yes	7 (21.9%)	4 (8.3%)	11 (13.8%)	
Death	No	17 (53.1%)	39 (81.3%)	56 (70.0%)	**0.007**
	Yes	15 (46.9%)	9 (18.8%)	24 (30.0%)	

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Table (4):Clinico-demographic data of affection of risk factors on remission rates .

		Response No CR N=36 N	Response No CR N=36 %	Response CR N=44 N	Response CR N=44 %	X^2	P	OR	(95% Confidence Interval)
Sex	Female	13	36.10%	15	34.10%	0.04	0.851	1.09	(0.43-2.75)
	Male	23	63.90%	29	65.90%				
Smoking	No	31	86.10%	41	93.20%	1.1	0.294	0.45	(0.1-2.04)
	Yes	5	13.90%	3	6.80%				
IPT	M1	4	11.10%	7	15.90%	6.04	0.302	0.8	(0.05-12.1)
	M2	10	27.80%	11	25.00%				
	M4	14	38.90%	11	25.00%				
	M5	5	13.90%	13	29.50%				
	M6	0	0.00%	1	2.30%				
	M7	3	8.30%	1	2.30%				
Karyotype	Normal	29	80.60%	33	75.00%	8.54	0.287	2.99	(0.11-81.6)
	High risk	4	11.20%	1	2.30%				
	Low risk	3	8.40%	10	22.70%				
HCV	Yes	5	13.90%	0	0.00%	6.52	**0.011**	2.42	(1.85-3.17)
	No	31	86.10%	44	100.00%				
SPLEEN	No	18	50.00%	26	59.10%	0.66	0.416	0.69	(0.29-1.68)
	Yes	18	50.00%	18	40.90%				

		Response				X^2	P	OR	(95% Confidence Interval)
		No CR N=36		CR N=44					
		N	%	N	%				
LIVER	**No**	30	83.30%	35	79.50%	0.19	0.666	1.29	(0.41-4.03)
	Yes	6	16.70%	9	20.50%				
LN	**No**	26	72.20%	31	70.50%	0.03	0.862	1.09	(0.41-2.89)
	Yes	10	27.80%	13	29.50%				
Body mass index	**<25Kg/m2**	21	58.30%	11	25.00%	9.17	**0.002**	4.2	(1.62-10.9)
	>25Kg/m2	15	41.70%	33	75.00%				
PS	**0**	25	69.40%	35	79.50%	1.94	0.379	0.6	(0.18-2.08)
	1	10	27.80%	9	20.50%				
	2	1	2.80%	0	0.00%				
BM CELLUR	**HYPER**	7	19.40%	14	31.80%	1.58	0.454	0.87	(0.2-3.76)
	HYPO	16	44.40%	17	38.60%				
	NormO	13	36.10%	13	29.50%				

Table (5): Clinico-demographic data of lab findings .

		Body mass index		Total	Sig. (2-tailed)
		<25Kg/m2	**≥25Kg/m2**		
WBCs		46.9 ± 41.2	31.8 ± 32.4	37.9 ± 36.7	0.086
Hb		7.9 ± 1.3	8 ± 1.4	8 ± 1.3	0.781
PLT		35.8 ± 31.1	38.4 ± 20.5	37.4 ± 25.1	0.679
PB Blast %		39.7 ± 26.4	44.3 ± 28.2	42.5 ± 27.4	0.453
BMA BLAST%		55.9 ± 27.6	63.2 ± 25.9	60.3 ± 26.6	0.237
CRP		34 ± 25.8	43 ± 26.4	39.4 ± 26.4	0.136
ESR		58.2 ± 32	59.1 ± 29.9	58.7 ± 30.6	0.892
HCV `	***Yes***	3 (9.4%)	2 (4.2%)	5 (6.3%)	0.346
	No	29 (90.6%)	46 (95.8%)	75 (93.8%)	

Table (6): Clinico-demographic data of Univariate and multivariate analysis Overall survival .

Variables	factors	Overall survival					
		Univariate analysis			Multivariate analysis		
		HR	95% CI	*p* value	HR	95% CI	*p* value
Age	< 50	2.15	1.59–2.93	<0.001	2.1	1.52–2.91	<0.001
Gender	Male	1.4	1.03–1.91	0.033	1.36	0.99–1.87	0.053
Comorbidities	DM	1.65	1.12–2.44	0.011	1.36	0.89–2.07	0.154
	HTN	1.15	1.06–2.17	0.024	1.03	0.69–1.54	0.882
PS	2	2.95	1.92–4.54	<0.001	2.78	1.76–4.35	<0.001

Variables	factors	Overall survival					
		Univariate analysis			Multivariate analysis		
		HR	95% CI	*p* value	HR	95% CI	*p* value
BMI	>25Kg/m2	1.58	1.10–2.27	0.012	1.61	1.09–2.38	0.017
Cytogenetics	Favorable	1.2	1.01-3.9	0.091	1.5	.89-3.09	0.002
	Intermediate	3.1	1.72–5.50	<0.001	2.53	1.37–4.69	
	Unfavorable	8.84	4.86–16.1	<0.001	8.36	4.44–15.7	

HR: hazard ratio; 95%CI: 95% confidence interval, p< 0.05 is significant.

Table (7):Cut off levels of Body mass index in predicting of complete remission, primary induction failure and early death.

	Complete remission	Primary induction failure	Early death
Body mass index Cut-off	**≥26.4**	**≤28.7**	**≤26.6**
Sensitivity	**75%**	**83.33%**	**90.91%**
Specificity	**66.67%**	**49.02%**	**59.42%**
AUC	**64.8**	**61.2**	**72.6**

DISCUSSION

Our present study evaluating the role of Body Mass Index as early indicator of outcome in adult acute leukemia patients receiving induction chemotherapy. 80 patients were included in our study. BMI and BSA calculation Patients' heights and weights were recorded at the time of induction chemotherapy. Two BMI categories are calculated in our study. Underweight patients were characterized by BMI strictly under 25, overweight with BMI more than or equal 25. BSA (m^2) was calculated according to the Dubois and Dubois formula: 0.007184 × height (cm0.725) × weight (kg0.425).

In our study 28 patients (35%) were males and 52 patients (65%) were females. This is in contrast to [11] who reported the incidence of leukemia higher in males than in females with male to female ratio of 1.1:1.0 but these results are in line with [13] who reported incidence of leukemia is higher in females. It may be attributed to diet, physical activity, menopausal status (estrogen levels), body fat distribution, and skeletal muscle condition, but further investigation (including of hormonal factors) will be necessary to clarify these findings.

In our study, it is clear that incidence of AML is common in overweight patients (60%) more than underweight and it is consistent with [12] and it is likely due to impaired immune function associated with obesity or it may be due to Circulating free leptin plasma levels which are most noteworthy in hefty people. Imperatively, leptin receptors are communicated on fringe blood mononuclear cells and leptin appears to advance survival of circulating blood monocytes. Hence, myeloid cells may be especially responsive to the fortifying impacts of leptin[14].

In our study we found in our patients 47 % anemic symptoms, 26% bleeding, this is in line with data published by[17] who noted that manifestations of bone marrow failure represent the most common initial clinical presentation but in contrast to[16] who reported extramedullary manifestations (hepatomegaly, splenomegaly, and lymphadenopathy) are the initial clinical presentation in acute leukemia.

In our study we found that there is statistically significant increase in rates of Remission in overweight group and it is in line with [15] which shows slight better CR rates in overweight group, and it is against [10] that refers to no significant changes in CR rates between two groups. It is may be due to racial factors in Asian or African people whom food habits are different.

We found a statistically significant difference between the overweight patients and underweight patients regarding death rates within first month of induction chemotherapy (P=0.007). There is an increase in rates of death rates in the group of underweight patients than overweight group and it is in line with [18]who reported decrease of death rates in obese patients, as Overweight/obese patients received higher total doses of chemotherapy in their study and unadjusted and adjusted logistic regression analyses with adverse events as the outcome showed no significant association between toxicity and BMI, but it isn't in line with [19] that dose adjustment and possible weight normalization should be considered in overweight patients as the outcome showed significant association between toxicity and BMI.

The present study concur with Li et al., [20] who concluded that, Overweight and obesity was associated with an increased incidence of AML (relative risk [RR], 1.23; 95% confidence interval [CI], 1.12–1.35; $P < 0.001$). High BMI did not significantly affect overall survival (OS) (hazard ratio [HR], 0.97; 95% CI, 0.92–1.03; $P = 0.323$) or disease-free survival (HR, 0.98; 95% CI, 0.88–1.10; $P = 0.755$) in patients with non-APL AML. By contrast, APL patients with high BMI had shorter OS (HR, 1.77; 95% CI, 1.26–2.48; $P = 0.001$) and a higher risk of differentiation syndrome (HR, 1.53; 95% CI, 1.03–2.27, $P = 0.04$).

As regarding to cytogenetics, it is considered the most important prognostic factor for AML patients. In our study it had significant P value 0.001 for OS detection and is in line with [18] who reported 3 prognostic factors related affected OS and DFS one of them was adverse cytogenetics risk.

Our results are harmony with Dhakal et al. [21] who conducted that, One-year OS values for normal/underweight, overweight, and obese groups was 42%, 45%, and 39%, respectively (P = .31). On multivariate analysis, obesity was associated with worse OS compared to normal-weight (hazard ratio = 0.6; 95% confidence interval, 0.4-0.9; P = .03) but not overweight patients. Obesity confers worse prognosis in AML. Differences in OS were not the result of differences in chemotherapy dose.

Our study refers to importantance of BMI as predictive value in detection of response to chemotherapy in adult patients of acute myeloid leukemia, in addition to its value to expect overall survival and rates of death between patients so we can adjust chemotherapy to different group of leukemic patients to achieve good response and avoid injurios outcomes .

Conflicts of interest:

The authors declare that they have no competing interests.

Limitations of the study:

There are limitations to this study. It was retrospective with an unplanned analysis of patients undergoing standard induction chemotherapy for AML. Only patients who received non-dose adjusted cytotoxic chemotherapy dosages were included, and data were collected prior to routine dose-escalation of daunorubicin in younger adults.

While we adjusted for major, known prognostic factors impacting outcome in AML patients treated with induction chemotherapy, it was impossible to adjust for all possible prognostic and predictive factors. Thus, there may be additional differences among the groups that could not be detected.

Financial and technical obstacles limited usage of other prognostic cytogenetics.

CONCLUSION

In intensively treated AML patients, BMI can bear a significant prognostic impact on outcome. Cancer cachexia is associated with poorer outcomes and disease progression. As regarding to cytogenetics, it is considered one of the most important prognostic factors for AML patients.

REFERENCES

[1] Esteyand Döhner H. Acute myeloid leukaemia. The Lancet. 2006 Nov 25;368(9550):1894-907.

[2] Estey EH. Therapeutic options for acute myelogenousleukemia. Cancer: Interdisciplinary Inter. J of the American Cancer Society. 2001 Sep 1;92(5):1059-73.

[3] Rowe JM, Neuberg D, Friedenberg W, Bennett JM, Paietta E and Makary AZ. A phase 3 study of three induction regimens and of priming with GM-CSF in older adults with acute myeloid leukemia: a trial by the Cooperative Oncology Group. Blood. 2004 Jan 15;103(2):479-85.

[4] Mandelli F, Vignetti M, Suciu S, Stasi R, Petti MC, Meloni G, et al. Daunorubicin versus mitoxantrone versus idarubicin as induction and consolidation chemotherapy for adults with acute myeloid leukemia: the EORTC and GIMEMA Groups Study AML-10. J of clinical oncology. 2009 Nov 10;27(32):5397.

[5] Cole TJ, Bellizzi MC, Flegal KM and Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ. 2000 May 6;320(7244):1240.

[6] Barlow SE. Expert committee recommendations regarding the prevention, assessment, and

treatment of child and adolescent overweight and obesity: summary report. Pediatrics. 2007 Dec 1;120(Supplement 4):S164-92.

[7] Biswal S and Godnaik C. Incidence and management of infections in patients with acute leukemia following chemotherapy in general wards. E cancer med. Sci. 2013;7.

[8] Chandran R, Hakki M,andSpurgeon S. Infections in leukemia. Sepsis-An Ongoing and Significant Challenge. 2012 Oct 3.

[9] Kumar A, Roberts D, Wood KE, Light B, Parrillo JE, Sharma S,et al . Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock. Critical care med. 2006 Jun 1;34(6):1589-96.

[10] Kempf E, Hirsch P, Labopin M, Viguié F, Isnard F, Tang R,et al . Prognosis of body mass index and chemotherapy dose capping in acute myeloid leukemia. Leukemia research. 2014 Dec 1;38(12):1425-9.

[11] Siegel R, Ward E, Brawley O and Jemal A. The impact of eliminating socioeconomic and racial disparities on premature cancer deaths. Ca-a Cancer J for Clinicians. 2011 Jul 1;61(4):212-36.

[12] Ilhan G, Karakus S and Andic N. Risk factors and primary prevention of acute leukemia. Asian Pacific J of Cancer Prevention. 2006;7(4):515.

[13] Schlenk RF, Benner A, Krauter J, Tefferi E and Hoagland HC.Individual patient data-based meta-Analysis of patients aged 16 to 60 years with core binding factor acute myeloid leukemia: a survey of the German Acute Myeloid Leukemia Intergroup.2004**.** J Clin Oncol. 22:3741.

[14] Sanchez-Margalet V, Martin-Romero C, Santos-Alvarez J, Goberna R, Najib S and Gonzalez-YanesC**.**Role of leptin as an immunomodulator of blood mononuclear cells: mechanisms of action. Clin ExpImmunol. 2003;133:11–9.

[15] Medeiros BC, Othus M, Estey EH, Fang M andAppelbaum FR. Impact of body-mass index on the outcome of adult patients with acute myeloid leukemia. haematologica. 2012 Sep 1;97(9):1401-4.

[16] Cheson B, Bennett J, Kopecky K, Lister TA, Tallman MS, Estey EH, et al**.** Revised recommendations of the international working group for diagnosis, standardization of response criteria, treatment outcomes, and reporting standards for therapeutic trials in AML. J Clin Oncol; (2003) 21: 4642-4649.

[17] Weinblatt ME. Acute myelocytic leukaemia. http://www.emedicine. com/ ped/ topic 1301. html. 2004.

[18] Harada K, Doki N, Hagino T, Miyawaki S, Ohtake S and Kiyoi H. Underweight status at diagnosis is associated with poorer outcomes in adult patients with acute myeloid leukemia: a retrospective study of JALSG AML 201. Ann. of hematology. 2018 Jan 1;97(1):73-81.

[19] Dickson TM, Kusnierz-Glaz CR, Blume KG, Negrin RS and Hu WW. Impact of admission body weight and chemotherapy dose adjustment on the outcome of autologous bone marrow transplantation. Biology of Blood and Mar. Trans. 1999 Oct 1;5(5):299-305.

[20] Li S, Chen L, Jin W, Ma X, Ma Y, Dong F, Zhu H, Li J, Wang K. Influence of body mass index on incidence and prognosis of acute myeloid leukemia and acute promyelocytic leukemia: A meta-analysis. Scientific reports. 2017 Dec 21;7(1):1-0.

[21] Dhakal P, Lyden E, Lee A, Michalski J, Al-Kadhimi ZS, Maness LJ, Gundabolu K, Bhatt VR. Effects of obesity on overall survival of adults with acute myeloid leukemia. Clin. Lymph. Myel. and Leuk. 2020 Mar 1;20(3):e131-6.

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