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A CROSS-SECTIONAL STUDY ON THE SOCIO-DEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF THALASSEMIA PATIENT'S IN QUETTA, BALOCHISTAN

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ABSTRACT

Objective: To find out the socio-demographic and clinical profile of individuals with Thalassemia in Quetta, Balochistan. Thalassemia is a genetic blood disorder, characterized by improper synthesis of alpha and beta globin proteins of hemoglobin.

Methods: A cross-sectional study was conducted from January 2019 to December 2021 at Thalassemia Centers of Bolan Medical Complex and Provincial Sandeman Civil Hospitals, Quetta. A questionnaire was used to collect the data from 306 (N) β-Thalassemia patient's aged <10-50 years. Data were analyzed using SPSS 24 with a significance level of $p<0.05$.

Results: Significant associations were found between age, socioeconomic status, consanguinity and education levels ($p<0.01$), while geographical residence showed non-significant associations ($p>0.05$). Thalassemia prevalence was highest among those <10 years (69.3%) and lowest among those 41-50 years (0.3%). Urban areas showed a higher prevalence (59.1%) than rural areas (40.8%).The lower socio-economic class showed a higher prevalence (80.1%) than the upper class (19.9%). Distribution of family history highest among one child patient (63.7%) from each family had the largest percentage followed by 02 child (25.8%) and 03 child patients was (10.5%) cases from each family with thalassemia. Also, in this study the number of dead cases in each family due

to thalassemia complication was found high i-e (87.3%). Most of cases manifested under the age of 01year i-e (76.5%). In clinical traits maximum number (68.3%) of recorded patient's followed by (81.6%) of patient's had hepatomegaly and splenomegaly, while (31.7%) of recorded patient's followed by of (18.4%) of patient's had no hepatomegaly and splenomegaly. Also showed a result of maximum number (96.7%) with splenomegally and minimum number of cases operated for splenectomy (Surgical removal of spleen) was (03.3%).

Conclusion: In Balochistan, Pakistan this is the first study on the socio-demographic and clinical aspects of thalassemia. The prevalence of thalassemia is impact by variables like consanguinity, poverty, illiteracy, and clinical complications worsen with advancing age. To address the unique requirements of thalassemia disease in this area, efforts should be concentrated on stringent preventative measures and healthcare programs.

Key Word: Hemoglobin (Hb), Iron Chelation Treatment (ICT),Thalassemia intermedia (Ti) Thalassemia Major(TM), Thalassemia Minor (TMi),Transfusion Dependent Thalassemia (TDT)

INTRODUCTION

Thalassemia is a genetic disorder, of blood that causes defective synthesis of hemoglobin (Hb), it's a type of protein which contain alpha and beta chain. During thalassemia defective hemoglobin cannot carry oxygen effectively, therefore hemoglobin cannot deliver oxygen to tissue, (1) *Blood institute, thalassemia (2012)*. Thalassemia has two types according to their chain α and β, are carried by the mutation in hemoglobin gene, (2) *Ansari SH et al (2018).* The affected person of β-thalassemia has a burden of α-globin chains in hemoglobin due to absent or reduced β-globin chain, (3) *Surapon T (2011)*. Based on the mutation type of one or both β-globin chain the severity is established. (4) *Surapon T (2008).* A child to have thalassemia both parents must be carries and with this a 25% chance in each pregnancy will develop a condition known as hemoglobinopathy, *(5) Ahmed S, et al (2022).*

The history of thalassemia is almost over a century when it was identified in Mediterranean children by Dr. Thomas cooley. (6) *Tabassum S et al (2022*). Mainly this disease came from the populations of the Indian sub-continent, Middle East, and Mediterranean regions but now it is expanded to other parts of the globe such as Africa, Italy, and South Asia, (1, 7). *Blood Institute, Thalassemia's. (2012) Tyan PI, (2014)*. Globally thalassemia affects 1.5% of population per annum. (1&8) *Blood institute, thalassemia (2012) & Colah R et al (2010).* Worldwide 280 million cases of thalassemia were reported in 2015, in which 16,800 deaths were reported mostly in third world nations due to high cost of treatment, (8 & 9) *Colah R et al (2010) & lancet. GBD (2015).*It's significant to prevent β-thalassemia but because of frequent transfusions can cause iron access, which damage heart and liver, (6) *Tabassum S et al (2022).*

Also thalassemia is a most common genetic disease in Pakistan, and between 05 to 09 thousand of newborn babies get birth with thalassemia each year, out of that 05% to 07% population with β-thalassemia, (10) *Biswas A et al (2016).* Patients of thalassemia in Pakistan does not survive for more than 10-year because of high economic burden on families as compared to developed nations, where the age range of thalassemia patients is about 10 to 50 years.(11) *Tanveer T et al (2018).* The patients which are thalassemic use almost quarter of the blood collection in blood banks and, that is almost about 40,000 children in a year. This explains the transfusion and treatment burden of thalassemia in a country with less resources like Pakistan, (6) *Tabassum S et al (2022)*. High birth rate, low literacy, consanguineous, and early marriages they cause increase in the ratio of thalassemia patients per year in Pakistan, (12) *Saleem N et al (2021).*

Significant success has been achieved in controlling the spread of β-thalassemia in developed countries by controlling through strict polices for screening before marriage, effected families and pregnant women and her husband is regularly done for the presence of β-thalassemia. (13) *Shakeel M, et al (2016).*

In Balochistan, it is estimated that prevalence of Thalassemia is at a higher scale than other provinces of Pakistan. There may be many contributing factors including socio-demographic nomenclature. However, literature is deficient particularly with reference to Balochistan, therefore the present study was designed to know the socio-demographic and clinical characteristics of thalassemia patient's in Balochistan.

METHODOLOGY

Study Design:

This descriptive and cross-sectional study was performed from 01st January 2019 to 31st December 2021at the thalassemia centers of Bolan Medical Complex, and Provincial Sandeman Civil Hospitals Quetta.

Data collection:

The designed questionnaire was used for the collection of data which was filled by patients, or their guardians**.** There were (N-306) patients who filled out the questionnaire. Patients filled the information regarding their age, education, socio-economic status, geographical area, clinical traits, consanguinity, and family history.

Statistical analysis:

Microsoft Excel and SPSS (Statistical Process for Social Science) 24 were used to analyze and assess the results of the data.

The Ethical Committee approval, (Reference no, 23151/BMCH, dated 28th December 2019) was taken.

Results:

Table 01: Age-wise distribution of β-Thalassemia patient's according to β-Thalassemia sub-types (N=306)

Age group distribution	β-Thalassemia Types						p-value
	Major		Intermedia		Total		
	Number	Percentage	Number	Percentage	Number	Percentage	
<10	180	72.3%	32	56.1%	212	69.3%	x^2=22.443 (p-value 0.0001) HS
11-20	65	26.1%	18	31.6%	83	27.1%	
21-30	04	01.6%	03	05.3%	07	02.3%	
31-40	00	00	03	05.3%	03	01.0%	
41-50	00	00	01	01.7%	01	00.3%	
Total	**249**	**100%**	**57**	**100%**	**306**	**100%**	
HS: Highly Significant, x^2: Chi-square test							

The results on age-wise distribution of β-thalassemia patient's according to β-thalassemia sub-types are given in table 01. Maximum (69.3%,p <0.05) number of thalassemia patients were recorded under less than 10 years of age followed by age group from 11-20 years (27.1%,p <0.05). Minimum percentage (0.30, p <0.05) of survived patients were recorded in age group from 41-50years of age.

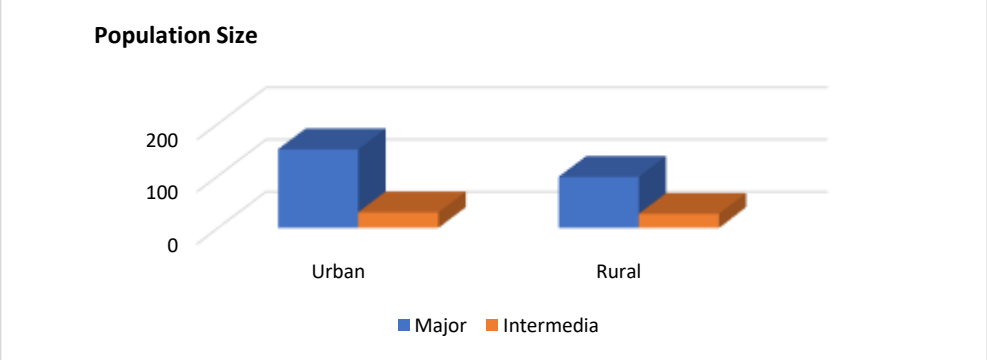

Figure 0I: Geographical Distribution of β-Thalassemia patient's (N=306)

The figure shows geographical distribution of β-thalassemia patients' maximum (59.1%, p > 0.05) number belong to the urban areas and minimum (40.8%, p >0.05) number belong torural areas.

Table; 02: Socio-economic status of β-Thalassemia patient's. (N=306)

Socio economic status	**β-Thalassemia types**						**p-value**
	Major		**Intermedia**		**Total**		
	Number	Percentage	Number	Percentage	Number	Percentage	
Lower class	212	85.1%	33	57.9%	245	80.1%	x^2=21.572 (p-value 0.000) HS
Upper class	37	14.9%	24	42.1%	61	19.9%	
Total	**249**	**100%**	**57**	**100%**	**306**	**100%**	
HS: Highly significant, x^2: Chi-square test							

The results of socio-economic status of β-Thalassemia patient'sare given in table 02. Maximum (85.1%) number belong to the lower class and minimum (14.9%) number belong from upper class families of major type of β-thalassemia and same situation seen in thalassemia inter media where high percentage found in lower class and low percentage found in upper class families.The results showed a highly significant association with the p-value (< 0.01).

Table; 03: Education level distribution of β-Thalassemia patient's (N=306)

Education level	**β-Thalassemia Types**						**p-value**
	Major		**Intermedia**		**Total**		
	Number	Percentage	Number	Percentage	Number	Percentage	
Pre-school	59	23.7%	02	03.5%	61	19.9%	x^2=31.486 (p-value 0.000) HS
Illiterate	161	64.7%	34	59.7%	195	63.8%	
Primary	15	06.0%	15	26.4%	30	09.8%	
Intermediate	04	01.6%	01	01.7%	05	01.6%	
Secondary	05	02.0%	02	03.5%	07	02.3%	
Higher	05	02.0%	03	05.2%	08	02.6%	
Total	**249**	**100%**	**57**	**100%**	**306**	**100%**	
HS: Highly Significant, x^2: Chi-square test							

The results of table 03 shows the distribution of education level in β-thalassemia patient's maximum (64.7%, p <0.05) number of study participants were recorded illiterate followed by pre-school (23.7%, p <0.05) number participant, Minimum percentage (02.0, p <0.05) were recorded in secondary and higher class participant but much higher participant seen in secondary and higher classes participant of thalassemia intermedia cases.

Table;04: Consanguinity (familial relation) ratio in β-Thalassemia patient's (N-306)

Groups	**Frequency**	**Percentage**
Positive consanguinity	263	85.9%
Non-consanguinity	043	14.1%
Total	**306**	**100%**

The results of table 04 show the distribution of consanguinity ratio in β-thalassemia patient's Maximum (85.9%) number were found to be positive for consanguinity and 43 (14.1%) were non-consanguineous relation.

Table; 05: Family history of β-Thalassemia disease in study patient's (N=306)

Family history	**Groups**	**Frequency**	**Percentage**
Family history of thalassemia disease in the family	01 per family	195	63.7%
	02 per family	079	25.8%
	03 per family	032	10.5%
Number of dead in family because of Thalassemia	Yes	267	87.3%
	No	039	12.7%
	Total	**306**	**100%**

The table 05 shows the distribution of family history of thalassemia, maximum number of one child patient was (63.7%) cases from each family had the largest percentage followed by 02 child patients was (25.8%) cases and minimum number of 03 child patients (10.5%) cases from each family. Also in this study the number of dead cases in each family due to thalassemia complication was found high i-e (87.3%) cases.

Table; 06: β-Thalassemia patient's distribution based on their clinical traits, (A, N=306), (B, N=296)

Clinical traits		**Total**		**p-value**
Hepatomegaly	Yes	170	68.3%	x^2=0.055 p-value (0.814) NS
	No	079	31.7%	
Splenomegaly	Yes	195	81.6%	x^2=0.115 p-value (0.734) NS
	No	044	18.4%	
NS: Non-Significant, x^2: Chi-square Test, A: β-thalassemic patients had Hepatomegaly andSplenomegaly				

Clinical traits		**Total**		**p-value**
Splenectomy	Yes	008	03.2%	x^2=0.013 p-value (0.909) NS
	No	241	96.8%	
Total		**249**	**100%**	
NS: Non-Significant, x^2: Chi-square test ***B: β-thalassemic patients had Splenomegaly after excluding the cases of Splenectomy***				

The table 06 of β-thalassemia patient's distribution based on their clinical traits shows that maximum number of (68%) recorded patients followed by (31.7%, p > 0.5) of patients had hepatomegaly and also patients have splenomegaly maximum number (81.6%) recorded followed by minimum number of (18.4%, p >0.5). Also showed a result of maximum number (96.7%, p >0.5) not done splenectomy and minimum number of cases operated for splenectomy (03.3%, p >0.5).

DISCUSSION

Thalassemia disease may have many contributing factors marriages between close relatives, illiteracy, poverty, psychological and economic burden on families of thalassemia patients and increased birth rate. In Pakistan due to limited allocated funds towards health and large number of populations. In addition, lack of awareness is another persistent problem which has resulted in increased number of thalassemia cases in this country (12) *Saleem N et al (2021).* In Balochistan, such studies are lacking in literature. This study focused on these gaps to find out socio-demographic and clinical characteristics of thalassemia patient's in Balochistan.

Socio-demographic factors in this study showed that prevalence of thalassemia major was higher than thalassemia intermedia due to high prevalence of thalassemia gene in Balochistan. Like our findings, similar study done by A Webthal in showed 75% of patients had βTM and 25% had βTI (14) *Qurat-ul-Ain LA et al; (2011)* and a study done by Qurat-ul-Ain 93% of patients were diagnosed with βTM and 07% had βTI (15) *Al-Attar MS, and Sabir SM; (2006).*

It was found in this study that thalassemia patients showed varied survival rates. The maximum survival rate was found in less than 10-year age. The trend of survival declined as age of the patients increased i.e. 11-20, 21-30, 31-40 and 41-50 years of age. Regarding age groups, most β-thalassemic patients were <10 years (n=212, 69.3%), and with growing age the number of patients reduced, another study agrees with this study done at Erbil, Iraq in which the highest percentage of

age group was found in patients <10 years (35%) and with rising age the disease becomes severe, and patients required blood transfusion on regular basis (16) *Majeed T, et al; (2013).* In a study by Tazeen Majeed showed that most patients were <15 years of age with a percentage of (48%) (17) *Al-Ali ZA, and Faraj SH; (2016).* Researcher Abdul Karim concluded that patients <10 years of age group found in higher percentage and the number reduced after 30 years and the reason can be explained by increasing burden of disease (18) *Khan MS, et al; (2015).*

In present study, more of the participants were from urban areas than rural areas i-e (59.1%) and (40.8%) cases respectively because Balochistan has a largest province of Pakistan area wise and the basic facilities are only present in urban area and this agrees with another study by Mustafa Sabir Al-attar in which the urban group (60%) than rural group (40%) according to their geographical distribution (16) *Majeed T, et al; (2013).* In contrast, study done by Shahzad A rural areas (64%) cases have an increased number of patients compared to urban areas (36%) which is different from this study (19) *Badur A, et al; (2021).*

The educational status of patients in this study showed higher illiteracy number, and the lowest number of patients were intermediate pass with highly significant association. A similar study showed that the majority of patients were illiterate (28.5%) but the highest level of education was master level (5.4%) (20) *Manzoor I, and Zakar R; (2019).*

Current study showed maximum number has positive results of consanguinity (familial relation) and minimum number of patients was non-consanguineous which favor high level thalassemia patients in Balochistan as compare to other provinces of Pakistan. A similar study by Muhammad Sadiq Khan in Bannu also concluded that 74% of diagnosed patients were related and 26% of had no relation with each other (14) *Qurat-ul-Ain LA et al; (2011)* and another study where the positive rate of cousin marriage was 77.4% and 22.6% patients were unrelated (17) *Al-Ali ZA, and Faraj SH; (2016).*. Another Study showed similar results in Egyptian people (21*) Shah FT et al; (2019).*

β-Thalassemia is a genetic disorder, so it can affect the maximum number of children in a family. This can happen because of a lack of knowledge and awareness about the disease. In this study, the maximum percentage of β-thalassemia patients was found in the 1st birth order (63.7%) and minimum number in 3rd birth order (10.5%). This correspond with the study in which 48.72% of patients were from 1st birth order (15) *Al-Attar MS, and Sabir SM; (2006).*This result also agrees with another study in which 40% of patients were from 1st birth order which was the highest (16) *Majeed T, et al; (2013).*

Because of iron overload in patients who received blood transfusions regularly, hepatomegaly can develop due to irregular use of iron chelator again illiteracy and costly treatment is a contributing factor. In this study, 68% of patients were positive for hepatomegaly. A similar study agrees with our study, in which 50 % of patients had hepatomegaly. (22)*Berak M M, and Habibzadeh H; (2004).*

Hepatomegaly and splenomegaly have a substantial relationship, and, in this study, splenomegaly was found in maximum number of patients and these results close with another study in which 64.9% of patients had splenomegaly (23).*Saeed U et al; 2015).* This agrees with another study in which 50% of patients had splenomegaly (24) *Casale M,et al; (2013).*In our study splencotomy was done in 3.3% of β-thalassemic patients. A study done by Maddalena Casale concluded that there was a considerable reduction in iron levels and blood consumption levels after splenectomy, most patients of BTM were better who had splenectomy (24) *Casale M, et al; (2013).*

CONCLUSION AND RECOMMENDATION

In Balochistan, Pakistan this is first study on the socio-demographic and clinical aspects of thalassemia. The prevalence of thalassemia is impacted by variables like consanguinity, poverty, illiteracy, and clinical complications worsen with advancing age.

It was found that survival rate of thalassemia patients was maximum among patients of less than ten years of age. The urban population was found to be more affected as compared to rural population.

Maximum study participants were illiterate, similarly maximum family belongs to lower class, and as in consanguinity highest ancestors were found.
Therefore to address the unique requirements of thalassemia in this area, efforts should be concentrated on stringent preventative measures, healthcare policies and large scale study recommended.

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- **Authors' Contribution:**
- **SMK, ZN & IKU:** Conceived/ designed, analysis and editing of manuscript and agreement to be accountable.
- **SMI & ZM:** Help in data collection, and drafting the manuscript.
- **MAK & AJP**; Help in data collection and statistical analysis.

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