Original Article

Characteristics of patients with phenylketonuria in Mazandaran Province, northern, Iran

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Abstract

Background: *Phenylketonuria (PKU) is an autosomal recessive disease of Phenylalanine metabolism that brings deficiency of the enzyme Phenylalanine Hydroxylase (PAH). Early diagnosis is very important to prevent complications. This study was designed to describe characteristics of patients with phenylketonuria in Mazandaran Province in northern Iran.*

Methods: *We studied 24 cases suffering from PKU in Mazandaran. We analyzed the variables like diagnosis age, current age of the patients, history of previous child (/or children) with PKU, sib of parents and level of education of patients.*

Results: *The mean age of diagnosis was 20 months and most of the patients were diagnosed in the first year of their life. The mean current age is 90 months. Seventy percent of them were male. Ten percent had a history of PKU in previous child/children. Sixty percent of the patients had blood relationship.*

Conclusion: *There is no doubt of the efficacy of the early diagnosis of PKU with newborn screening, followed by dietary treatment in most patients. All of our patients had been diagnosed without screening only due to clinical symptoms.*

Key words: *Phenylketonuria (PKU), Phenylalanine hydroxylase (PAH) deficiency, autosomal recessive, mental retardation.*

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Phenylketonuria (PKU) is an inborn error of phenylalanine (Phe) metabolism with an estimated prevalence of 1:10,000 (1,2). Inheritance is autosomal recessive caused by mutations in the phenylalanine hydroxylase gene. This enzyme converts phenylalanine to tyrosine in liver which is also a precursor for dopamine (1). The diagnosis of PKU is based upon the finding of an elevated serum concentration of Phe (3). The results are accumulation of phenylalanine in tissues, blood and other body fluids. Blood phenylalanine concentrations are used to classify hyperphenylalaninemias as classical Phenylketonuria (1,4). Untreated Phenylketonuria causes severe neurological impairment, mental retardation, reduction of IQ level to 60 until first year and behavioral difficulties (1,5). Hyperactivity may occur as well as hypopigmentation, specific smell of body secretion and malodorous urine and eczematous rash. The ferric chloride urine test is a sign of increased Phenyl pyruvic acid level (3,5). The current therapy for PKU/HPA involves limiting Phe intake by a special semi synthetic diet (6). A Phe-restriction diet can lower plasma Phe levels and may prevent the mental impairments of PKU patients. The first dietary therapy for PKU was administered in 1958 (7) and it had been used for the treatment of many cases from classic PKU to mild HPA (8). The best prognosis in controlling blood phenylalanine level is before the first month of birth (5). This study was designed to describe PKU patients in Mazandaran Province and focused on the diagnosis age before screening program, geographical frequency, M/F ratio of patients, mean age of patients, the effect of blood relationship of parents and frequency of sibling PKU in the same family.

According to this information, this study will clarify the condition of the PKU patients in Mazandaran, introduce the most prevalent cities in Mazandaran, benefit the screening in decreasing diagnosis age, importance of sex and relative parents in PKU.

Methods

This is a descriptive-analytic study and was done on all patients who suffered from PKU (24 patients) in Mazandaran. The diagnosis had been confirmed by serum phe. level (HPLC method). PKU in Mazandaran consists of 15 patients in Sari and 9 in Babol, and they were managed outpatiently at the Metabolism Clinic. Four of these patients did not participate in this study due to loss of interest. Consequently, our data consisted of 20 patients. All patients were referred to the clinic and they filled up a questionnaire. The studied variables contain diagnosis age, current age of the patients, history of previous child (/or children) with PKU and consanguinity of patients. The data were collected and analyzed.

Results

Seventy percent of PKU patients who participated in this study were male. Because of dossier loss in hospital archive we could not access to the all data of a patient. As mentioned in table 1 the minimum Diagnosis age was 6 day-old, the maximum was 8 year-old and the average age of diagnosis was 20 months-old.

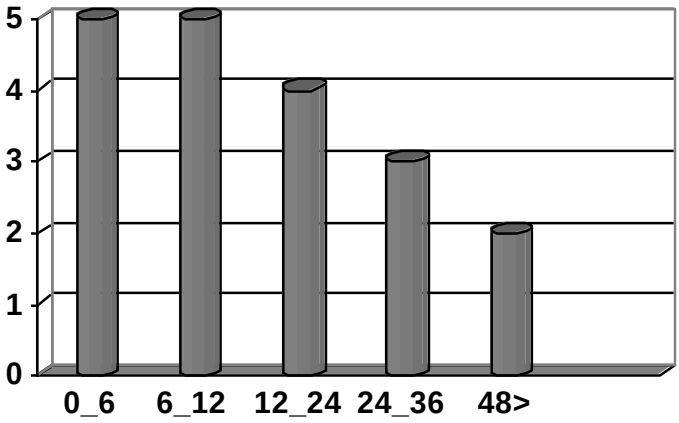

Figure1: Frequency of the diagnosis age.

Figure1 indicates most patients diagnosed in age 0-12 months old. As shown in figure 2, most of the children (26.3%) who were diagnosed of PKU in Mazandaran were from Babol). There was blood relationship in 60 % of patient's parents (12/20). According to patients data most of the children (60%) who suffered from PKU have parents who have blood relationship. 10% of patients (2/20) had history of PKU in previous child.

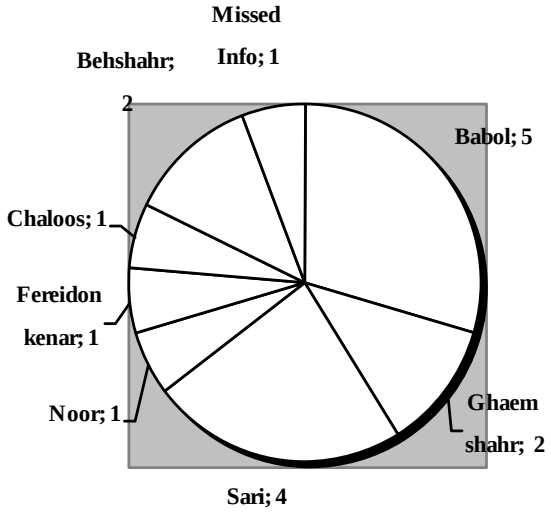

Figure2: Frequency of birth location.

In our study we design to analyze diagnosis age before and after the screening program, but because of a limited new case after the screening program (just two new cases) which was not meaningful in statistical basis.

Discussion

Phenylketonuria (PKU) is a classical example of an autosomal recessive disorder of Phe. Metabolic disease (3,9). There is no doubt of the efficacy of early diagnosis of PKU with newborn screening, followed by dietary treatment in most patients (10). UNIVERSAL NEWBORN SCREENING (NBS) for Phenylketonuria(PKU) is typically described as one of the most successful public health programs in the history of modern medicine (11). In Mazandaran Province, majority of our patients have been diagnosed without screening but only due to clinical symptoms. As mentioned before, the mean age diagnosis was 20 mo/o and at this age, cerebral side effects existed and this confirmed the need for screening program (9,12-15). But the diagnosis age can be reduced by screening the infants for PKU for early management and preventing the complications (1).

According to the birth places of the patients, Babol and Sari are the most frequent sites of PKU and this may be due to their big population, geographical or genetic factors. This

study shows 60% of parents have blood relationship and as a result, if we decrease familial marriage we will decrease almost half of our patients in Mazandaran. Two Families in Mazandaran have 2 children suffering from PKU and this is a dramatic tragedy. It shows these families need more information about the disease and consultants will be most effective in PKU management. In conclusion, there is no doubt of the efficacy of the early diagnosis of PKU with newborn screening, followed by a dietary treatment in most patients. All of our patients were diagnosed without screening but only due to clinical symptoms.

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