The Turkish Journal of Pediatrics
1970 / Vol. 12 / Nos. 3-4 / pp. 72 - 75

The Incidence of the Inability to Smell Solutions of Potassium Cyanide in the Rural Health Center of Ortabereket*

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It has been known for many years that some individuals are unable to smell hydrogen cyanide but this inability may be genetically controlled.[1] It is also known that this acid is a strong chemical poison.

The purpose in making this survey is to determine the incidence of the inability to smell the solution of potassium cyanide in the Rural Health Center of Ortabereket.

History

After Mourant remarked in 1950 that "One person out of four fails to smell hydrogen cyanide," many surveys were carried out in Europe, Africa, India, Japan and Australia where different results were reported.[2] Kirk, Stenhouse, and Fukomoto, et al studied families and suggested that the "inability to smell hydrogen cyanide" was inherited as a sexlinked recessive. Some familial studies however, gave different results.[3] Huser and his colleagues showed, by similar studies, that this trait is neither recessive nor sex-linked and concluded that it is probably autosomal dominant.[2] According to Brown and Robinette, the threshold for hydrogen cyanide odor does not seem to be a simple, segragating, genetically controlled trait.[2]

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* This study has been carried out during the externship for Public Health.

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In 1953, Kirk and Stenhouse[1] investigated an Australian population of 244 of which 132 were male and 112 were female, and determined the incidence of the inability to smell hydrogen cyanide as 18.2 per cent and 4.5 per cent, respectively. Fukomoto[3] and his colleagues reached almost identical results in 1957, and determined the incidence of non-smellers as 18.2 per cent among males and 5.5 per cent among females when testing 433 Japanese.

Material and Method

The population sample was chosen from the villages of Ortabereket, Feruz, Başbereket and Pınaryaka among persons whose ages ranged from ten to sixty-five years. The subjects were asked to smell potassium cyanide solutions. The villages were chosen at random and two out of every ten homes were taken. This way, a population composing of 105 males and 131 females would have been included. The sex distribution of the samples is shown in Table I. The sample shows that it represents the population by sex ($x^2 = 0.146$). In the final analysis however, only 68 males and 98 females were tested. For various reasons the remainder could not be reached.

TABLE I

POTASSIUM CYANIDE SMELLING TEST

Etimesgut, Ortabereket 1969

Sex Distribution of the Samples

	Male	Female	Total
Population Studied	105	131	236
Population not Studied	815	943	1758
Total	920	1074	1994
x^2: 0.146	$p < 0.05$	Degree of Freedom: 1	

The method used was similar to that of Kirk and Stenhouse. Two stoppered tubes, 1 cm. in diameter, containing 5 cc. of potassium cyanide - 10 per cent and 20 per cent, respectively, plus 5 cc. of distilled water were used for the test. The "non-smeller" subjects were asked to repeat the experiment to be sure of the result.

The tubes were mixed between the tests. Fresh solutions were made at the beginning of each testing day. The subjects were classified according to their response. Non-smellers could not smell any odor from either tube ; weak smellers could only smell the odor of the tube containing the solution of 20 per cent concentration ; strong smellers could smell the odor of both tubes.

Results

The potassium cyanide smelling test was planned to be carried out on a population of 236 individuals composed of 105 males and 131 females. However the test was performed on a population comprising of 166 individuals.

From the results, we found an obvious difference between the sexes in the incidence of non-smellers. 13.2 per cent of the males and 2.04 per cent of the females were unable to distinguish the odor of potassium cyanide. On the other hand, 20.6 per cent of the males and 18.37 per cent of the females were able to smell the odor of the tube containing the solution of 20 per cent concentration but were unable to smell the odor of the tube containing the solution of 10 per cent ; these were classified as weak smellers. 66.2 per cent of the males and 79.56 per cent of the females were able to discern the odor of both tubes. In Table II, the sex distribution among the non-smellers, and the weak and strong smellers is shown. The Khi-square method showed that there is an important difference between the sexes of the non-smellers ($x^2 = 9.99$).

Two of the non-smellers were brothers, but their children were strong smellers. In one family, the mother and the son were non-smellers. In another family, the father was a non-smeller and his two children (daughter and son) were weak smellers. There was another family where the parents were strong smellers but where the son was a non-smeller. The relatives of this family, who were in the village, were also tested and all found to be strong smellers.

Discussion

Our results are similar to the ones obtained by Kirk, Stenhouse, and Fukomoto et al. They also suggested that the inability to smell hydrogen cyanide was inherited as a sex-linked recessive. In their surveys, they found that non-smellers are more prevalent in males than in females. In our survey too, as seen in Table II, we reached the same conclusion and the difference between males and females may suggest that this inability is due to a sex-linked recessive gene. However, it should be remembered that the sample is too small to be conclusive, and the results may not give us a completely accurate account.

In a familial survey, we found that the mother and the son were non-smellers while the daughter was a strong smeller. From this we can conclude that the defect may be inherited as sex-linked. On the other hand, in another family, the father was a non-smeller whereas all his

TABLE II

POTASSIUM CYANIDE SMELLING TEST

Etimesgut, Ortabereket 1969

Sex Distribution Among the Non-smellers, Weak and Strong Smellers

	Male	%	Female	%	Total
Non-smellers	9	13.2	2	2.04	11
(Expected)	(4.5)		(6.5)		
Weak smellers	14	20.6	18	18.37	32
(Expected)	(13.1)		(18.17)		
Strong smellers	45	66.2	78	79.56	123
(Expected)	(50.3)		(72.6)		
Total	68	100.0	98	100.00	166
x^2: 9.99	p: 0.01-0.005		Degree of Freedom: 2		

children were strong smellers. If the son were a non-smeller, this could be against the hypothesis. In a third family, although the father was a non-smeller, and the mother a strong smeller, the daughter and son were weak smellers. In this condition, if we accept that the defect is inherited by a sex-linked recessive gene, then we could not expect the son to be a weak smeller, in a condition other than the Klinefelter Syndrome (XXY). This finding may mean that there are some other complex genetic factors affecting the inability to smell the odor of potassium cyanide. We can conclude therefore that, "Our survey suggests that the trait is inherited by a sex-linked recessive gene, although some other unknown complex genetic factors sometimes intervenes".

Summary

A potassium cyanide smelling test was carried out in four villages of the Rural Health Center of Ortabereket to determine the incidence of the inability to smell solutions of cyanide. This was determined as 2.04 per cent among 98 females and 13.2 per cent among 68 males. Because the families are small, we were not able to give conclusive statements about the inheritance. But we can conclude that our survey may suggest that the trait is inherited by a sex-linked recessive gene and that there may be some other complex genetic factors intervening in this inheritance.

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