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Prevalence of Endocrine Disorders Among Down Syndrome Individuals in Ksa: A Cross-Sectional Study

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RESEARCH

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ABSTRACT

Objective

To determine the prevalence of endocrine disorders among individuals with Down Syndrome in KSA.

Methods

This research employs a cross-sectional study design to investigate the prevalence of endocrine disorders among individuals with Down Syndrome in the Kingdom of Saudi Arabia (KSA). A cross-sectional approach allows us to collect data at a single point in time from a diverse group of participants, providing a snapshot of the prevalence and characteristics of endocrine disorders within the study population.

Results

The study included 686 participants. The participants asked if they had a child with Down syndrome. Most of them answered no (n= 576, 84%) followed by yes (n= 110, 16%). The most frequent child age who has Down syndrome among study participants was 7-10 years (n= 45, 40.9%) followed by 3-6 years (n= 30, 27.3%). The most frequent child gender who has Down syndrome among study participants was female (n= 57, 51.8%) followed by male (n= 53, 48.2%). Father's educational level among study participants with most of them having a university (n= 82, 74.5%). Mother's educational level among study participants with most of them having a university (n= 77, 70%). Participants were asked if there was a first-degree relationship between the parents. There 55 had a first-degree relationship with (50%), and 55 didn't have a first-degree relationship between parents with (50%). Participants were asked the female about two diseases polycystic ovary disease there were 12 had it (10.9%), 62 didn't have it (56.4%), and the second disease was Turner syndrome 22 had it (20%) and 53 participants didn't have it (47.3%).

Conclusion

Study results showed that most of the study participants don't have Down Syndrome according to the parent's answers. Half of the participants have a first-degree relationship between their parents. The most educational level for parents was the university.

Key Words

Endocrine disorders, Down Syndrome.

Introduction

The prevalence of endocrine disorders among individuals with Down Syndrome (DS) is a matter of increasing significance, particularly in the context of healthcare within the Kingdom of Saudi Arabia (KSA). Down Syndrome, a genetic condition caused by the presence of an extra copy of chromosome 21, often presents a complex medical profile, making individuals with DS more susceptible to various health challenges, including endocrine disorders. Understanding the frequency and nature of endocrine disorders in this specific population is critical for providing optimal care and improving their overall quality of life. To address this important issue, this research endeavors to conduct a comprehensive cross-sectional study in KSA, shedding light on the prevalence of endocrine disorders among individuals with DS and contributing to the broader understanding of their healthcare needs. This study aims to serve as a valuable resource for clinicians, researchers, and policymakers in Saudi Arabia and beyond, as they work towards enhancing the well-being of individuals with Down Syndrome.

A wide variety of diseases were recently discovered in a study of the largest recorded cohort of people with Down syndrome (DS) in the United States [1]. Compared with age- and sex-matched controls, those with DS were shown to have significantly worse endocrine-specific symptoms [1]. Recent studies have shown that endocrine disorders, including thyroid dysfunction and diabetes mellitus, are more common in people with Down syndrome [2-7].

This brief report is a follow-up to a larger study [1] that used clinical data from the largest sample of people with DS in the United States, who were treated at a single, unified facility in the Midwest that houses the largest center of care for adolescents and adults with DS in the country [8-10]. The purpose of this study was to contribute to the limited body of clinical research on this rare but rising patient group by shedding light on endocrine-specific issues experienced by people with DS.

The research problem at the heart of this study revolves around the prevalence of endocrine disorders among individuals with Down Syndrome (DS) in the Kingdom of Saudi Arabia (KSA). Down Syndrome, a genetic condition, is associated with intellectual and developmental disabilities, and it presents a complex medical profile that includes a heightened risk of various health complications, such as endocrine disorders. While there is a substantial body of research on DS globally, there is a notable gap in specific data related to the prevalence and characteristics of endocrine disorders in individuals with DS in the Saudi Arabian context. This research problem stems from the need to address this gap and to provide a more targeted and informed approach to healthcare for individuals with DS in KSA.

Further compounding this problem is the lack of a comprehensive understanding of the unique genetic and environmental factors that may influence the development of endocrine disorders in individuals with DS in KSA. Genetic factors related to the regional population and consanguinity rates, as well as environmental factors such as nutrition, lifestyle, and healthcare access, may play a significant role in the occurrence and progression of endocrine disorders in this population. Without a detailed examination of these factors, it is challenging to develop tailored interventions and treatment strategies for individuals with DS in KSA, which leads to a critical gap in healthcare knowledge.

Additionally, the research problem extends to the potential disparities in the diagnosis and management of endocrine disorders in individuals with DS within KSA's healthcare system. Variability in healthcare practices, accessibility, and awareness of endocrine disorders in this population may exist across different regions of the country, potentially leading to inequities in healthcare outcomes. Addressing this problem is not only important for the well-being of individuals with DS but also for the broader goal of achieving more equitable and inclusive healthcare services in KSA.

Methods

Study design

This research employs a cross-sectional study design to investigate the prevalence of endocrine disorders among individuals with Down Syndrome in the Kingdom of Saudi Arabia (KSA). A cross-sectional approach allows us to collect data at a single point in time from a diverse group of participants, providing a snapshot of the prevalence and characteristics of endocrine disorders within the study population.

Study approach

The study will be conducted in various healthcare facilities across KSA, including hospitals, clinics, and specialized centers that provide care to individuals with Down

Syndrome. Data collection will take place in multiple regions to ensure a representative sample and account for potential regional variations in healthcare access and outcomes.

Study population

The study focuses on individuals of all ages with Down Syndrome residing in KSA. The population includes individuals of Saudi and non-Saudi nationality who have been diagnosed with Down Syndrome and are receiving healthcare services within the country.

Study sample

A stratified random sampling technique will be used to select a representative sample from the population of individuals with Down Syndrome in KSA. The sample size will be determined based on statistical considerations, with an emphasis on achieving adequate power for robust prevalence estimation. Stratification will take into account different age groups and geographic regions to ensure diversity within the sample.

Study tool

For the current study, a questionnaire was adopted for data collection, which was also categorized as a study tool.

Data collection

Data will be collected through medical records and direct assessments. Medical records will provide information on previous diagnoses and treatments, while direct assessments will include physical examinations and laboratory tests to confirm the presence of endocrine disorders. Data collection will be carried out by trained healthcare professionals.

Data analysis

Data analysis will involve descriptive statistics to determine the prevalence and characteristics of endocrine disorders in the study population. Inferential statistics, such as chi-square tests and logistic regression, will be employed to explore potential associations between various factors and the presence of endocrine disorders. Statistical software packages will be used for data analysis, and the significance level will be set at $p < 0.05$.

Ethical considerations

The study will adhere to ethical guidelines and obtain approval from relevant institutional review boards and ethics committees. Informed consent will be obtained from participants or their legal guardians, ensuring that their rights, privacy, and confidentiality are respected throughout the research process. Additionally, any potential conflicts of interest will be disclosed, and the study will be conducted with the utmost integrity and transparency.

Results

The study included 686 participants. The participants asked if they had a child with Down syndrome. Most of them answered no (n= 576, 84%) followed by yes (n= 110, 16%). Figure 1 shows the percentage of participants who have a child with Down syndrome.

The most frequent child age who has Down syndrome among study participants was 7-10 years (n= 45, 40.9%) followed by 3-6 years (n= 30, 27.3%). Figure 2 shows the child age distribution among study participants.

The most frequent child gender who has Down syndrome among study participants was female (n= 57, 51.8%) followed by male (n= 53, 48.2%). Figure 3 shows the child gender distribution among study participants.

Father's educational level among study participants with most of them having a university (n= 82, 74.5%). Mother's educational level among study participants with most of them having a university (n= 77, 70%).

Participants were asked if there was a first-degree relationship between the parents. There 55 had a first-degree relationship with (50%), and 55 didn't have a first-degree relationship between parents with (50%). Figure 4 shows the first-degree relationship between the parents.

Participants were asked the female about two diseases polycystic ovary disease there were 12 had it (10.9%) and 62 didn't have it (56.4%), and about the second disease was Turner syndrome 22 have it (20%) and 53 participants didn't have (47.3%).

Participants were asked to assess their diseases. Their responses and results are presented in Table 1.

Discussion

One in every 787 newborns is diagnosed with Down syndrome (DS) [11,12], making it the most prevalent chromosomal disorder. About 5,000 infants in the United States are born each year with Down syndrome [12]. Congenital heart disease, obstructive sleep apnea, celiac disease, and endocrinopathies are only some of the medical conditions linked to DS [13]. There is an increased prevalence of endocrine diseases, such as hypothyroidism, poor bone density, diabetes, short stature, infertility, and an increased inclination to be overweight or obese [14]. Many endocrine disorders have accurate diagnosis and effective therapies, but best practices have not yet been defined.

New insights into the etiology and treatment of endocrine abnormalities, which may have serious consequences for health and development if left untreated, have emerged in recent years. The medical profession has the challenge of continuing to optimize our medical therapies to decrease morbidity and promote function as the life expectancy of persons with DS increases, from a median age of 4 in the 1950s to 58 in 2010 [11]. Care for patients with DS is discussed, with an emphasis on recent developments, points of contention, and expert opinion.

Bone Health

Obesity, insufficient exercise, insufficient calcium and vitamin D intake, a lack of muscle mass, a lack of sun exposure, a malabsorption condition, or the use of anti-epileptic drugs are only some of the factors that might hinder bone growth [14]. Patients with Down syndrome are more likely to experience these, which puts them at risk for low BMD.

The most frequent method for determining BMD is by the use of dual energy x-ray absorptiometry (DXA). DXA is a flat, two-dimensional scan that reports bone mineral density (aBMD, g/cm2) but ignores bone volume. Short patients may have an underestimation of their bone mineral density due to this. Shorter individuals' BMD is more correctly reflected by volumetric BMD (g/cm3) and bone mineral apparent density (BMAD, bone mineral content (area2 height)) [14-18]. When comparing vBMD or BMAD, differences in aBMD between people with DS and controls were not maintained in multiple studies [15,17], highlighting the need of examining vBMD or BMAD.

Research on whether or not people with DS have lower bone mineral density is mixed. Recent investigations [18–20] have shown that persons with DS had lower BMD than controls. After reaching early adulthood, BMAD in the femoral neck decreased with age for both persons with and without DS [18], although the pace of change was faster for those with DS. Possible explanation for the lack of changes in vBMD or BMAD between individuals with DS and controls in earlier research [15,17] using younger participants. Carfi's group confirmed the common belief that BMD declines with age in individuals with DS by showing that the BMAD of adults with DS in their forties and fifties was comparable to that of controls in their sixties and seventies [18].

While BMD may give you an idea of how strong your bones are, it cannot tell you how well they function. Ts65Dn mice were employed in recent investigations because they are triploid for around 75% of the genes on human chromosome 21 [21]. Fowler's group showed that mechanical loading was adversely affected in Ts65Dn mice due to lower trabecular bone volume compared to controls. Adults with Down syndrome performed better than controls on quantitative ultrasonography heel measures [15]. Bone microarchitecture anomalies that may increase fracture risk in persons with Down syndrome require further investigation. Conflicting findings suggest that low bone mineral density (BMD) in DS may result from either excessive bone turnover/resorption or insufficient bone growth.

Calcium is essential for bone mineralization. Serum calcium and phosphorus levels in patients with DS are comparable to those in the control group [16,22,24]. Parathyroid hormone (PTH) concentrations in individuals with Down syndrome (DS) and controls are comparable in adult studies [15,22], but greater in children with DS [24]. People with DS have a higher prevalence of vitamin D insufficiency than the general population [24], although this difference may be marginal. Weight bearing exercise, plyometrics, and whole body vibration training [25-28] have all been shown to increase bone mineral density in this high-risk population, as has the addition of calcium and Vitamin D supplementation to an exercise program, leading to a greater increase in BMD than either nutritional or activity intervention alone [25]. Therefore, Vitamin D supplementation [22,23] of more than 400IU per day may be necessary for children with DS.

Bisphosphonates and intermittent parathyroid hormone (PTH) are two pharmacologic therapies used to increase BMD in humans. Improvements in trabecular microarchitecture and thickness as well as an increase in the number of osteoblasts on the bone surface were seen in Ts65Dn mice treated with intermittent PTH [21]. Fowler contends that since their study demonstrated reduced bone formation at baseline [21], bisphosphonates, which normally lower bone turnover, would not be useful in individuals with DS.

Conclusion

Study results showed that most of the study participants don’t have Down Syndrome according to the parent's answers. Half of the participants have a first-degree relationship between their parents. The most educational level for parents was the university.

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Prevalence of Endocrine Disorders Among Down Syndrome Individuals in Ksa: A Cross-Sectional Study

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Tables & Figures

Table 1: Diseases among study participants.

Survey item	Yes	No
Is there enlargement of the limbs?	23	87
	20.90%	79.10%
Is there a complete deficiency in pituitary hormones?	33	77
	30.00%	70.00%
Does your child or child suffer from Addison's disease ?	25	85
	22.70%	77.30%
Does your boy or girl suffer from Cushing's disease	26	84
	23.60%	76.40%
Does your child have Cystic fibrosis?	13	97
	11.80%	88.20%
Does your child have Hypothyroidism?	37	73
	33.60%	66.40%
Does your child have Increased thyroid activity?	17	93
	15.50%	84.50%
Multiple endocrine tumor type I	13	97
	11.80%	88.20%
Increased activity of the parathyroid gland	10	100
	9.10%	90.90%
Decreased activity of the parathyroid gland	15	95
	13.60%	86.40%
Increased secretion of the milk hormone (prolactin)	15	95
	13.60%	86.40%
Type 1 diabetes	20	90
	18.20%	81.80%

	14	96
Type 2 diabetes	12.70%	87.30%
	7	103
Gout	6.40%	93.60%

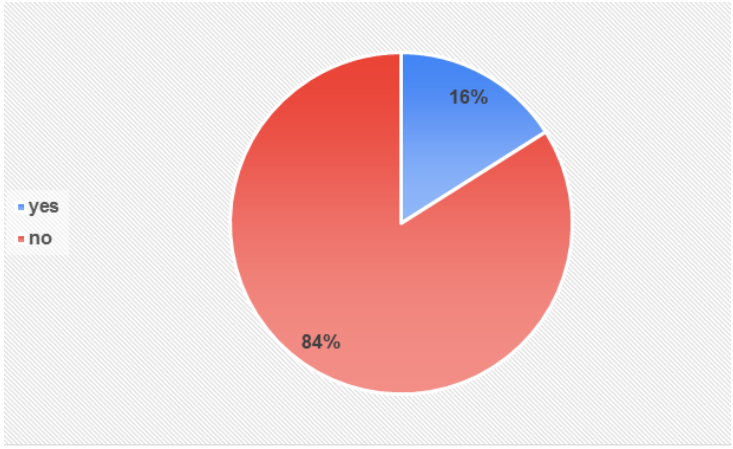

Figure 1: Child have Down syndrome

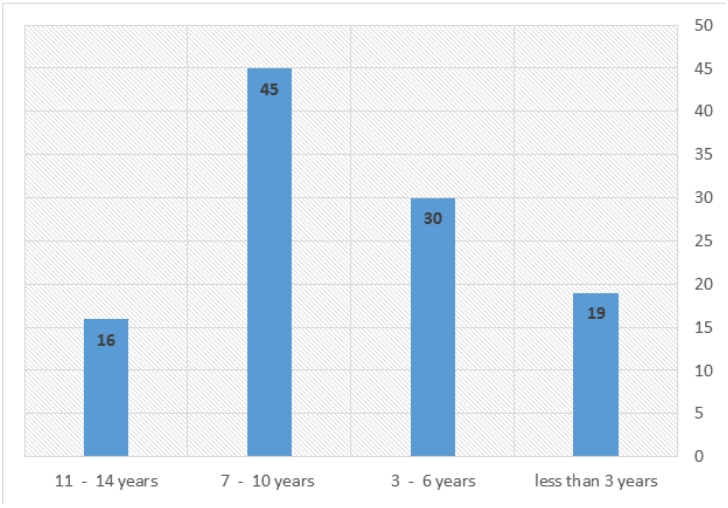

Figure 2: Age distribution among study participants

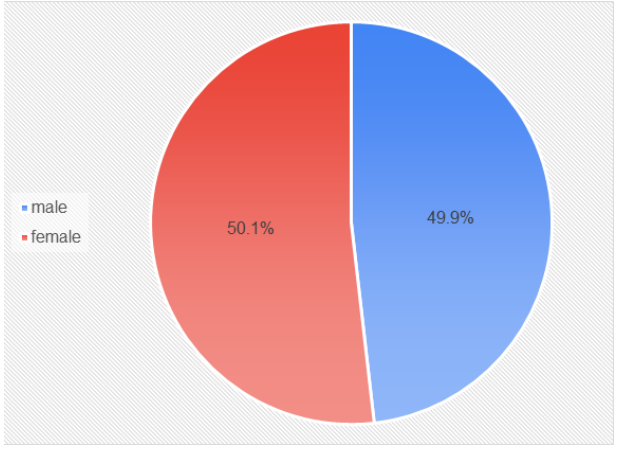

Figure 3: Child gender distribution among study participants.

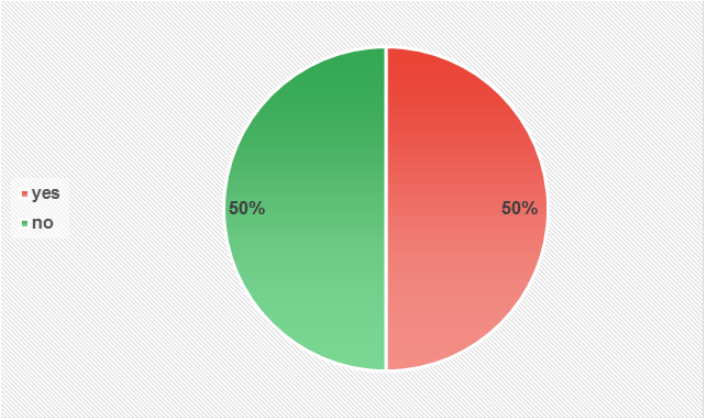

Figure 4: First-degree relationship between the parents among study participants.

ANNEXURE 1: Data Collection Tool

Do you have a child with Down Syndrome?

- Yes
- No

2. What is your child's gender?

- Male
- Female

3. How old is your child?

- **Less than 3**
- 3-6
- 7-10
- 11-14

4. Is there a first-degree relationship between the parents?

- Yes
- No

5. What is the father's educational level?

- Uneducated
- The school
- The university

6. What is the mother's educational level?

- Uneducated
- The school
- The university

7. Is there enlargement of the limbs?

- Yes
- No

8. Is there a complete deficiency in pituitary hormones?

- **Yes**
- No

9. Does your child or child suffer from Addison's disease (adrenal gland hormone deficiency)?

- Yes
- No

10. Does your boy or girl suffer from Cushing's disease (excess cortisone)?

- Yes
- No

11. Does your child have Cystic fibrosis?

- Yes
- No

12. Does your child have Hypothyroidism?

- Yes
- No

13. Does your child have Increased thyroid activity?

- Yes
- No

14. Polycystic ovary disease (female only)

- Yes
- No
- Do not apply

15. Multiple endocrine tumor type I

- Yes
- No

16. Increased activity of the parathyroid gland

- Yes
- No

17. Decreased activity of the parathyroid gland

- Yes
- No

18. Increased secretion of the milk hormone (prolactin)

- Yes

- No

19. Turner syndrome (female only)

- Yes
- No
- Do not apply

20. Type 1 diabetes

- Yes
- No

21. Type 2 diabetes

- Yes
- No

22. Gout

- Yes
- No

APPENDIX 2: Participants responses to scale items

variable		Frequency	Percent
Age	less than 3 years	19	17.3%
	3 - 6 years	30	27.3%
	7 - 10 years	45	40.9%
	11 - 14 years	16	14.5%
Gender	Male	53	48.2%
	Female	57	51.8%
Fathers' educational level	Uneducated	7	6.4%
	The school	21	19.1%
	The university	82	74.5%
Mothers' educational level	Uneducated	7	6.4%
	The school	26	23.6%
	The university	77	70.0%

Is there a first-degree relationship between the parents?	frequency	%
yes	55	50%
no	55	50%

Do you have a child with Down Syndrome?	frequency	%
yes	110	16%
no	576	84%

female only			
	yes	no	do to apply
Polycystic ovary disease	12 (10.9%)	62 (56.4%)	36 (32.7%)
Turner syndrome	22 (20%)	53 (47.3%)	36 (32.7%)

Crosstab

			Enlargement.limbs		
			yes	no	Total
Gender	Male	Count	15	38	53
		% of Total	13.6%	34.5%	48.2%
	Female	Count	8	49	57
		% of Total	7.3%	44.5%	51.8%
Total		Count	23	87	110
		% of Total	20.9%	79.1%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.380[a]	1	0.066		
Continuity Correction[b]	2.573	1	0.109		
Likelihood Ratio	3.414	1	0.065		
Fisher's Exact Test				0.099	0.054
Linear-by-Linear Association	3.350	1	0.067		
N of Valid Cases	110				

Gender * complete.deficiency.pituitary.hormones

Crosstab					
			Complete.deficiency.pituitary.hormones		
			yes	no	Total
Gender	Male	Count	26	27	53
		% of Total	23.6%	24.5%	48.2%
	Female	Count	7	50	57
		% of Total	6.4%	45.5%	51.8%
Total		Count	33	77	110
		% of Total	30.0%	70.0%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	17.687[a]	1	.000		
Continuity Correction[b]	15.980	1	.000		
Likelihood Ratio	18.473	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	17.527	1	.000		
N of Valid Cases	110				
Gender * addison.disease					

Crosstab					
			Addison.disease		
			yes	no	Total
Gender	Male	Count	18	35	53
		% of Total	16.4%	31.8%	48.2%
	Female	Count	7	50	57
		% of Total	6.4%	45.5%	51.8%
Total		Count	25	85	110
		% of Total	22.7%	77.3%	100.0%

Chi-Square Tests

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.351[a]	1	0.007		
Continuity Correction[b]	6.169	1	0.013		
Likelihood Ratio	7.525	1	0.006		
Fisher's Exact Test				0.011	0.006
Linear-by-Linear Association	7.284	1	0.007		
N of Valid Cases	110				

Gender * Cushing.disease

Crosstab					
			Cushing.disease		
			yes	no	Total
Gender	Male	Count	16	37	53
		% of Total	14.5%	33.6%	48.2%
	Female	Count	10	47	57
		% of Total	9.1%	42.7%	51.8%
Total		Count	26	84	110
		% of Total	23.6%	76.4%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.433[a]	1	0.119		
Continuity Correction[b]	1.783	1	0.182		
Likelihood Ratio	2.445	1	0.118		
Fisher's Exact Test				0.177	0.091
Linear-by-Linear Association	2.411	1	0.121		
N of Valid Cases	110				

Gender * Cystic.fibrosis

Crosstab					
			Cystic.fibrosis		
			yes	no	Total
gender	Male	Count	7	46	53
		% of Total	6.4%	41.8%	48.2%
	Female	Count	6	51	57
		% of Total	5.5%	46.4%	51.8%
Total		Count	13	97	110
		% of Total	11.8%	88.2%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.189[a]	1	0.663		
Continuity Correction[b]	.020	1	0.889		
Likelihood Ratio	.189	1	0.663		
Fisher's Exact Test				0.771	0.444
Linear-by-Linear Association	.188	1	0.665		
N of Valid Cases	110				

Gender * Hypothyroidism

Crosstab					
			Hypothyroidism		Total
			yes	no	
Gender	Male	Count	23	30	53
		% of Total	20.9%	27.3%	48.2%
	Female	Count	14	43	57
		% of Total	12.7%	39.1%	51.8%
Total		Count	37	73	110
		% of Total	33.6%	66.4%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.365[a]	1	.037		
Continuity Correction[b]	3.562	1	.059		
Likelihood Ratio	4.393	1	.036		
Fisher's Exact Test				.045	.029
Linear-by-Linear Association	4.325	1	.038		
N of Valid Cases	110				

Gender * Increased.thyroid.activity

Crosstab					
			Increased.thyroid.activity		Total
			yes	no	
Gender	Male	Count	7	46	53
		% of Total	6.4%	41.8%	48.2%
	Female	Count	10	47	57
		% of Total	9.1%	42.7%	51.8%
Total		Count	17	93	110
		% of Total	15.5%	84.5%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.395[a]	1	0.530		
Continuity Correction[b]	0.133	1	0.715		
Likelihood Ratio	0.397	1	0.528		

Fisher's Exact Test				0.604	0.359
Linear-by-Linear Association	0.392	1	0.531		
N of Valid Cases	110				

Gender * Multiple.endocrine.tumor.typeI

Crosstab					
			Multiple.endocrine.tumor.typeI		
			yes	no	Total
Gender	Male	Count	9	44	53
		% of Total	8.2%	40.0%	48.2%
	Female	Count	4	53	57
		% of Total	3.6%	48.2%	51.8%
Total		Count	13	97	110
		% of Total	11.8%	88.2%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.616[a]	1	0.106		
Continuity Correction[b]	1.747	1	0.186		
Likelihood Ratio	2.664	1	0.103		
Fisher's Exact Test				0.142	0.093
Linear-by-Linear Association	2.592	1	0.107		
N of Valid Cases	110				

Gender * Increased.activity.parathyroid.gland

Crosstab					
			Increased.activity.parathyroid.gland		
			yes	no	Total
Gender	Male	Count	6	47	53
		% of Total	5.5%	42.7%	48.2%
	Female	Count	4	53	57
		% of Total	3.6%	48.2%	51.8%
Total		Count	10	100	110
		% of Total	9.1%	90.9%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.615[a]	1	0.433		
Continuity Correction[b]	0.205	1	0.651		
Likelihood Ratio	0.617	1	0.432		
Fisher's Exact Test				0.517	0.326
Linear-by-Linear Association	0.610	1	0.435		
N of Valid Cases	110				

Gender * Decreased.activity.parathyroid.gland

Crosstab					
			Decreased.activity.parathyroid.gland		
			yes	no	Total
Gender	Male	Count	11	42	53
		% of Total	10.0%	38.2%	48.2%
	Female	Count	4	53	57
		% of Total	3.6%	48.2%	51.8%
Total		Count	15	95	110
		% of Total	13.6%	86.4%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.401[a]	1	.036		
Continuity Correction[b]	3.312	1	.069		
Likelihood Ratio	4.528	1	.033		
Fisher's Exact Test				.051	.034
Linear-by-Linear Association	4.361	1	.037		
N of Valid Cases	110				

Gender * Increased.secretion.milk.hormone

Crosstab					
			Increased.secretion.milk.hormone		
			yes	no	Total
Gender	Male	Count	8	45	53
		% of Total	7.3%	40.9%	48.2%
	Female	Count	7	50	57
		% of Total	6.4%	45.5%	51.8%
Total		Count	15	95	110
		% of Total	13.6%	86.4%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.185[a]	1	.667		
Continuity Correction[b]	.023	1	.879		
Likelihood Ratio	.185	1	.668		
Fisher's Exact Test				.783	.439
Linear-by-Linear Association	.183	1	.669		
N of Valid Cases	110				

Gender * Type1diabetes

Crosstab					
			Type1diabetes		
			yes	no	Total
Gender	Male	Count	13	40	53
		% of Total	11.8%	36.4%	48.2%
	Female	Count	7	50	57
		% of Total	6.4%	45.5%	51.8%
Total		Count	20	90	110

	% of Total	18.2%	81.8%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.769[a]	1	.096		
Continuity Correction[b]	2.007	1	.157		
Likelihood Ratio	2.796	1	.095		
Fisher's Exact Test				.137	.078
Linear-by-Linear Association	2.744	1	.098		
N of Valid Cases	110				

Gender * Type2diabetes

Crosstab					
			Type2diabetes		Total
			yes	no	
Gender	Male	Count	9	44	53
		% of Total	8.2%	40.0%	48.2%
	Female	Count	5	52	57
		% of Total	4.5%	47.3%	51.8%
Total		Count	14	96	110
		% of Total	12.7%	87.3%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.666[a]	1	0.197		
Continuity Correction[b]	1.009	1	0.315		
Likelihood Ratio	1.681	1	0.195		
Fisher's Exact Test				0.256	0.158
Linear-by-Linear Association	1.651	1	0.199		
N of Valid Cases	110				

Gender * Gout

Crosstab					
			Gout		Total
			yes	no	
Gender	Male	Count	5	48	53
		% of Total	4.5%	43.6%	48.2%
	Female	Count	2	55	57
		% of Total	1.8%	50.0%	51.8%
Total		Count	7	103	110
		% of Total	6.4%	93.6%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.618[a]	1	0.203		
Continuity Correction[b]	.777	1	0.378		
Likelihood Ratio	1.659	1	0.198		

Fisher's Exact Test				0.259	0.190
Linear-by-Linear Association	1.603	1	0.205		
N of Valid Cases	110				

Relationship.between.parents * enlargement.limbs

Crosstab					
			Enlargement.limbs		Total
			yes	no	
Relationship.between.parents	yes	Count	15	40	55
		% of Total	13.6%	36.4%	50.0%
	no	Count	8	47	55
		% of Total	7.3%	42.7%	50.0%
Total		Count	23	87	110
		% of Total	20.9%	79.1%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.694[a]	1	0.101		
Continuity Correction[b]	1.979	1	0.159		
Likelihood Ratio	2.728	1	0.099		
Fisher's Exact Test				0.159	0.079
Linear-by-Linear Association	2.669	1	0.102		
N of Valid Cases	110				

Relationship.between.parents * complete.deficiency.pituitary.hormones

Crosstab					
			Complete.deficiency.pituitary.hormones		Total
			yes	no	
Relationship.between.parents	yes	Count	18	37	55
		% of Total	16.4%	33.6%	50.0%
	no	Count	15	40	55
		% of Total	13.6%	36.4%	50.0%
Total		Count	33	77	110
		% of Total	30.0%	70.0%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.390[a]	1	0.533		
Continuity Correction[b]	.173	1	0.677		
Likelihood Ratio	.390	1	0.532		
Fisher's Exact Test				0.678	0.339
Linear-by-Linear Association	.386	1	0.534		
N of Valid Cases	110				

Relationship.between.parents * addison.disease

Crosstab					
			addison.disease		
			yes	no	Total
relationship.between.parents	yes	Count	15	40	55
		% of Total	13.6%	36.4%	50.0%
	no	Count	10	45	55
		% of Total	9.1%	40.9%	50.0%
Total		Count	25	85	110
		% of Total	22.7%	77.3%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.294[a]	1	0.255		
Continuity Correction[b]	.828	1	0.363		
Likelihood Ratio	1.301	1	0.254		
Fisher's Exact Test				0.363	0.182
Linear-by-Linear Association	1.282	1	0.257		
N of Valid Cases	110				

Relationship.between.parents * Cushing.disease

Crosstab					
			Cushing.disease		
			yes	no	Total
Relationship.between.parents	yes	Count	18	37	55
		% of Total	16.4%	33.6%	50.0%
	no	Count	8	47	55
		% of Total	7.3%	42.7%	50.0%
Total		Count	26	84	110
		% of Total	23.6%	76.4%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.037[a]	1	.025		
Continuity Correction[b]	4.080	1	.043		
Likelihood Ratio	5.140	1	.023		
Fisher's Exact Test				.042	.021
Linear-by-Linear Association	4.991	1	.025		
N of Valid Cases	110				

Relationship.between.parents * Cystic.fibrosis

Crosstab					
			Cystic.fibrosis		
			yes	no	Total
relationship.between.parents	yes	Count	6	49	55
		% of Total	5.5%	44.5%	50.0%
	no	Count	7	48	55
		% of Total	6.4%	43.6%	50.0%
Total		Count	13	97	110
		% of Total	11.8%	88.2%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.087[a]	1	.768		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.087	1	.768		
Fisher's Exact Test				1.000	.500
Linear-by-Linear Association	.086	1	.769		
N of Valid Cases	110				

Relationship.Between.Parents * Hypothyroidism

Crosstab					
			Hypothyroidism		
			yes	no	Total
Relationship.between.parents	yes	Count	20	35	55
		% of Total	18.2%	31.8%	50.0%
	no	Count	17	38	55
		% of Total	15.5%	34.5%	50.0%
Total		Count	37	73	110
		% of Total	33.6%	66.4%	100.0%

Chi-Square Tests					
	Value	**df**	**Asymptotic Significance (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	0.367[a]	1	0.545		
Continuity Correction[b]	0.163	1	0.686		
Likelihood Ratio	0.367	1	0.545		
Fisher's Exact Test				0.687	0.343
Linear-by-Linear Association	0.363	1	0.547		
N of Valid Cases	110				

Relationship.between.parents * Increased.thyroid.activity

Crosstab					
			Increased.thyroid.activity		
			yes	no	Total
Relationship.between.parents	yes	Count	10	45	55
		% of Total	9.1%	40.9%	50.0%
	no	Count	7	48	55
		% of Total	6.4%	43.6%	50.0%
Total		Count	17	93	110
		% of Total	15.5%	84.5%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.626[a]	1	0.429		
Continuity Correction[b]	0.278	1	0.598		
Likelihood Ratio	0.629	1	0.428		
Fisher's Exact Test				0.599	0.299
Linear-by-Linear Association	0.620	1	0.431		

N of Valid Cases	110				

Relationship.between.parents * Multiple.endocrine.tumor.typeI

Crosstab					
			Multiple.endocrine.tumor.typeI		Total
			yes	no	
Relationship.between.parents	yes	Count	8	47	55
		% of Total	7.3%	42.7%	50.0%
	no	Count	5	50	55
		% of Total	4.5%	45.5%	50.0%
Total		Count	13	97	110
		% of Total	11.8%	88.2%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.785[a]	1	0.376		
Continuity Correction[b]	0.349	1	0.555		
Likelihood Ratio	0.791	1	0.374		
Fisher's Exact Test				0.556	0.278
Linear-by-Linear Association	0.778	1	0.378		
N of Valid Cases	110				

Relationship.between.parents * Increased.activity.parathyroid.gland

Crosstab					
			Increased.activity.parathyroid.gland		Total
			yes	no	
Relationship.between.parents	yes	Count	8	47	55
		% of Total	7.3%	42.7%	50.0%
	no	Count	2	53	55
		% of Total	1.8%	48.2%	50.0%
Total		Count	10	100	110
		% of Total	9.1%	90.9%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.960[a]	1	0.047		
Continuity Correction[b]	2.750	1	0.097		
Likelihood Ratio	4.215	1	0.040		
Fisher's Exact Test				0.093	0.047
Linear-by-Linear Association	3.924	1	0.048		
N of Valid Cases	110				

Relationship.between.parents * Decreased.activity.parathyroid.gland

Crosstab					
			Decreased.activity.parathyroid.gland		Total
			yes	no	
Relationship.between.parents	yes	Count	11	44	55
		% of Total	10.0%	40.0%	50.0%
	no	Count	4	51	55
		% of Total	3.6%	46.4%	50.0%

Total	Count	15	95	110
	% of Total	13.6%	86.4%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.782[a]	1	.052		
Continuity Correction[b]	2.779	1	.096		
Likelihood Ratio	3.913	1	.048		
Fisher's Exact Test				.093	.047
Linear-by-Linear Association	3.748	1	.053		
N of Valid Cases	110				

Relationship.between.parents * Increased.secretion.milk.hormone

Crosstab

			Increased.secretion.milk.hormone		
			yes	no	Total
Relationship.between.parents	yes	Count	10	45	55
		% of Total	9.1%	40.9%	50.0%
	no	Count	5	50	55
		% of Total	4.5%	45.5%	50.0%
Total		Count	15	95	110
		% of Total	13.6%	86.4%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.930[a]	1	.165		
Continuity Correction[b]	1.235	1	.266		
Likelihood Ratio	1.962	1	.161		
Fisher's Exact Test				.266	.133
Linear-by-Linear Association	1.912	1	.167		
N of Valid Cases	110				

Relationship.between.parents * Type1diabetes

Crosstab

			Type1diabetes		
			yes	no	Total
Relationship.between.parents	yes	Count	11	44	55
		% of Total	10.0%	40.0%	50.0%
	no	Count	9	46	55
		% of Total	8.2%	41.8%	50.0%
Total		Count	20	90	110
		% of Total	18.2%	81.8%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.244[a]	1	.621		
Continuity Correction[b]	.061	1	.805		

Likelihood Ratio	.245	1	.621		
Fisher's Exact Test				.805	.403
Linear-by-Linear Association	.242	1	.623		
N of Valid Cases	110				

Relationship.between.parents * Type2diabetes

Crosstab					
			Type2diabetes		
			yes	no	Total
Relationship.between.parents	yes	Count	9	46	55
		% of Total	8.2%	41.8%	50.0%
	no	Count	5	50	55
		% of Total	4.5%	45.5%	50.0%
Total		Count	14	96	110
		% of Total	12.7%	87.3%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.310[a]	1	.252		
Continuity Correction[b]	.737	1	.391		
Likelihood Ratio	1.326	1	.250		
Fisher's Exact Test				.392	.196
Linear-by-Linear Association	1.298	1	.255		
N of Valid Cases	110				

Relationship.between.parents * Gout

Crosstab					
			Gout		
			yes	no	Total
Relationship.between.parents	yes	Count	4	51	55
		% of Total	3.6%	46.4%	50.0%
	no	Count	3	52	55
		% of Total	2.7%	47.3%	50.0%
Total		Count	7	103	110
		% of Total	6.4%	93.6%	100.0%

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.153[a]	1	0.696		
Continuity Correction[b]	0.000	1	1.000		
Likelihood Ratio	0.153	1	0.696		
Fisher's Exact Test				1.000	0.500
Linear-by-Linear Association	0.151	1	0.697		
N of Valid Cases	110				

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