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## Thyroid Cancer, Clinical and Hystopathological Study on Patients under 25 Years in Tabriz, Iran (2000-2012)

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**Abstract:** Thyroid cancer comprises a broad spectrum of diseases with variable prognoses. The aim of this study was to assess thyroid cancer in young population using the surveillance, epidemiology and end results database and whether radioactive fallout from the Chernobyl accident in 1986 influenced thyroid cancer incidence among children and adolescents in Tabriz, Iran. Patients aged 5-25 in Tabriz from April 2000 to April 2012 were studied. Using the surveillance and end results database, the study examined the overall incidence of thyroid cancer with variations based on tumor pathology, size and stage, as well as the current surgical therapy of thyroid carcinoma. This study demonstrated a positive correlation between thyroid carcinoma tumor size and stage of disease. Mortality rates were higher among men than women. Recurrence rates are also higher in men. Compared with women, men have greater likelihood of loco regional lymph node involvement and more than twice the rate of distant metastases. Operative treatment for thyroid cancer also has shifted with Radical dissection+Total thyroidectomy replacing partial thyroidectomy as the most common surgical procedure. Our data indicate that the increasing incidence of thyroid cancer cannot be accounted for fully by an increased detection of small neoplasms. This study show the increasing in thyroid cancer incidence related to exposure to radiation from the Chernobyl accident.

**Key words:** Thyroid cancer, surveillance, epidemiology, chernobyl accident, tumor

### INTRODUCTION

Thyroid Carcinoma (TC) is an uncommon disease with an annual incidence ranging from 0.3 to 10 per 100,000 persons, according to official statistics (Akyildiz *et al.*, 2010; Goldust and Rezaee, 2013; Goldust *et al.*, 2013a; Lotti *et al.*, 2013). Morphologically, four main types of thyroid carcinoma are distinguished, with different etiology and prognosis: Papillary Thyroid Carcinoma (PTC) and Follicular Thyroid Carcinoma (FTC) (differentiated) carcinomas (Goldust *et al.*, 2013b, c; Mohebbipour *et al.*, 2012). The Anaplastic Thyroid Carcinoma (ATC) (undifferentiated) type is uncommon at young ages and Medullary Thyroid Carcinoma (MTC), a tumor of the thyroid C cell that secretes calcitonin (Goldust *et al.*, 2013d; Nehs *et al.*, 2010; Sadighi *et al.*, 2011; Vafae *et al.*, 2012). Numerous studies have described the increasing incidence of thyroid cancer; however, debate continues on whether these findings reflect a true increase of relevant disease or simply an improved diagnostic surveillance or pathologic recognition of incidental neoplasm with little clinical significance (Goldust *et al.*, 2012; Golfurushan *et al.*, 2011; Milan *et al.*, 2011; Pezzolla *et al.*, 2010). Some groups have

proposed that the increasing use of cervical ultrasonography and fine needle aspiration contributes to the identification of clinically unimportant cancers (Fardiazar *et al.*, 2012; Goldust *et al.*, 2011; Sadeghpour *et al.*, 2011). If this theory is true, then a greater proportion of earlier stage cancers should be noted. Davies and Welch support this theory by showing that neoplasm <1 cm representing micropapillary thyroid cancer (microPTC) accounted for 49% of the overall increase of thyroid cancer in their study (Davies and Welch, 2006). They did not, however, do any correlation of tumor size to stage of disease. Others have suggested that the increase in thyroid cancer is real and have observed an increase in thyroid cancer of all stages. Enewold *et al.* (2009) examined demographic changes in thyroid cancer and found a substantial increase in larger cancers (>2 cm). Although, the exact etiology of this trend is not yet known, some investigators have suggested that radiation or other unknown environmental factors are possible contributors to the increase in incidence of thyroid malignancy (Bullock 2010; Ganjpour Sales *et al.*, 2012; Nikanfar *et al.*, 2012; Sadeghpour *et al.*, 2012; Spiess, 2010). Exposure to radiation gives rise to differentiated types, notably to the papillary type,

although a causal association for the other types cannot be excluded (Karzar *et al.*, 2012; Martinez *et al.*, 2010; Shakeri *et al.*, 2013; Vahedi *et al.*, 2012). The management of thyroid cancer has changed substantially over the past several decades, largely as a result of the rapid increase in understanding of the genetic pathogenesis of thyroid cancer and the availability of newer diagnostic tools, along with a wealth of epidemiological data (Farhoudi *et al.*, 2012; Nourizadeh *et al.*, 2013; Seyyednejad *et al.*, 2012; Sipos and Mazzaferrri, 2010). As a result, there has been a gradual evolution of the diagnostic and therapeutic paradigms that have been applied to the management of this disease, especially the application of rapidly emerging novel targeted therapies, the use of newer sensitive diagnostic tools and the use of large databases that challenge clinical wisdom (Ganjpour Sales *et al.*, 2013; Salehi *et al.*, 2013a, b). It is thus not surprising that controversies swirl around the management of thyroid cancer (Fardiazar *et al.*, 2013; Pacini *et al.*, 2010; Salehi *et al.*, 2013c; Soleimanpour *et al.*, 2013). Well-differentiated thyroid cancers often have an indolent clinical course with low morbidity and mortality. With some exceptions, these are among the most curable of cancers (Daghigh *et al.*, 2013; Nemati *et al.*, 2013; Qadim *et al.*, 2013). As a consequence, patients are sometimes advised that thyroid cancer is not a serious problem; an attitude that trivializes the importance of the disease and is certainly not the view of most patients. Nonetheless, this may lead some patients and physicians to forgo long-term follow-up that is an essential component of management (Goforoushan *et al.*, 2013; Rakotoarisoa *et al.*, 2010; Razi *et al.*, 2013; Salehi *et al.*, 2012; Yousefi *et al.*, 2013). This study assessed trends in thyroid cancer incidence from 2000-2010 in the young population using the surveillance, epidemiology and end results database.

**MATERIALS AND METHODS**

In this descriptive-analytical study, we studied patients admitted for thyroid cancer and various other conditions to department of surgery, Imam Khomeyni hospital, Tabriz University of Medical Sciences from April 2000 to April 2010. Patients below the age of 25 with histologically confirmed thyroid cancer diagnosed within 1 year previously were considered. Total 242 cases (56 males and 186 females) aged 5-25 were interviewed. The local cancer registry was used to check recruitment of thyroid cancer cases. A standard questionnaire was used for information on demographic factors, general characteristics, personal and family history of thyroid diseases, relevant medical conditions (i.e., metabolic and

immunological disorders), diagnostic and therapeutic procedures (X-rays and radiotherapy) and history of residence in endemic goiter areas. Patients were counted as having thyroid disease only if diagnosis had been made at least 1 year before cancer discovery. Five histological groups were considered. The large majority of the thyroid cancers were papillary (76%), the remainder was composed of follicular (12%), medullary (6%), other carcinomas (5.2%) and of anaplastic type (0.8%). Stages included local disease (tumor confined to the thyroid); regional disease (lymph node involvement); or distant disease (metastatic spread to distant organs). Operative therapies were defined as follows: (1) Partial thyroidectomy included lobectomy and isthmusectomy, (2) Total thyroidectomy was restricted to cases in which the entire thyroid was removed or a near total thyroidectomy was performed, (3) Radical dissection+Total Thyroidectomy and (4) Complementary. SPSSSTM, version 16 is the used statistical software program. The association between 2 factor variables was estimated using  $\chi^2$  analysis. Regression equations included terms for age, sex, area of current residence and history of residence in endemic goiter area.

**RESULTS**

We studied 242 patients: 56 (23/1%) male and 186 (76/9%) female. The age of the patients ranged from 5 to 25 years, with a mean (SD) age of 12.4 (7.2) years.

**History of radiation:** There was not a history of obvious radiation to any of the patients.

**Family history:** There was a family history of thyroid cancer in 30 (12.3%) patients that 25 (10.3%) were female and 5 (2%) of them were male. There was not a significant difference between two sexes (p = 0.52).

**First patient’s symptoms:** Neck mass was the most prevalent symptom of the patients that exist in 200 (82.6) of the patients and disphonia was the less prevalent symptom that was exist in only 10 (4%) patients. Eight (3.3%) patients were symptom free (Table 1).

Table 1: First patient’s symptom between two sexes

First symptom	Male		Female		All the patents		p-value
	No.	%	No.	%	No.	%	
Neck mass	40	16.5	160	66.1	200	82.6	0.32
Dyspagia	5	2.0	30	12.3	35	13.3	0.24
Dispnea	4	1.6	32	13.2	36	14.8	0.18
Disphonia	2	0.8	8	3.3	10	4.1	0.48
Pain	4	1.6	18	7.4	22	9.0	0.38
Symptom free	1	0.4	7	2.8	8	3.2	0.14
Others	24	9.9	62	25.6	88	35.5	0.68

Table 2: Distribution of the patients according to sex and histological type

Histological type	Males		Females	
	No.	%	No.	%
Papillary	42	75	142	76.3
Follicular	7	12.5	22	11.8
Anaplastic	1	1.7	1	0.5
Medullary	3	5.3	11	5.9
Other	3	5.3	10	5.2

**Lymph node metastases:** The prevalence of lymph node metastases at initial surgery were seen in 24 (42.8%) of males and 72 (38.7%) females. Lymph node metastases exist only in PTC and there were not any lymph node metastases in FTC and MTC.

**Para clinic study:** In Fine Needle Aspiration (FNA) examination, the large majority of the thyroid cancers were papillary (76%), the remainder was composed of follicular (12%), medullary (6%), other carcinomas (5.2%) and of anaplastic type (0.8%) (Table 2).

In Isotope scan, 158 (64.3%) patients had cold nodules, 38 (15.7%) patients had hot nodules and 46 (19) patients had normal nodules.

**Extent of surgery:** Most patients (62.8%) underwent radical dissection+total thyroidectomy and the remainder (37.2%) underwent other types of surgery. For tumors <1 cm, the extent of surgery did not affect recurrence rates or survival. On the other hand, patients with tumors ≥1 cm had a 20% higher risk of recurrence if lobectomy alone was carried out (p = 0.04) (Table 3).

**Recurrence:** The incidence of recurrence was observed in 30 (12.3%) patients that 24 (9.9%) of them female and 6 (2.4%) of them were male. Recurrence was observed in PTC and FTC and was not observed in MTC.

**Survival:** The 5-year survival of patients diagnosed with thyroid carcinoma in 2000-2010 was 96% in patients between 5-25 years old. No significant differences in survival were observed between boys and girls.

**Mortality:** Mortality records from 2000 to 2010 show relatively stable or slightly improved mortality rates for thyroid cancer patients. However, over the same period, mortality rates measured in terms of relative survival show an overall significant decline (p<0.05 for trend) in mortality rates in women and an increase in mortality rates in men (p<0.05 for trend).

**Tumor size:** Tumor size correlates with outcome in patients with PTC; larger tumors are more likely to present with loco regional and distant metastases.

Table 3: Different type of surgery

Treatment	Female		Male		N	
	No.	%	No.	%	No.	%
Total thyroidectomy	27.5	52	32.1	18	28.9	70.0
Lobectomy	3.2	6	3.5	2	8.0	3.3
Radical dissection+	64.5	120	57.1	32	62.8	152.0
Total thyroidectomy						
Complementary	4.3	8	7	4	12.0	4.9

**Gender:** Mortality rates were higher among men than women. Recurrence rates are also higher in men. Compared with women, men have greater likelihood of loco regional lymph node involvement (42.8 vs. 38.7%) and more than twice the rate of distant metastases.

## DISCUSSION

We described the pattern of occurrence of thyroid cancer in Tabriz, Iran over the period 2000-2010, using the assembled database on childhood and adolescent cancer. Overall, this study confirms female predominance in thyroid cancer occurrence in children and adolescents, its increasing frequency with age, high proportion of papillary tumor type, growing incidence over time and low fatality from this cancer. Despite the steady worldwide increase in the incidence of thyroid cancer, the disease remains relatively uncommon, comprising only 1.18 per 100000 people around the world (Akslen and Livolsi, 2000; Al-Sheyab *et al.*, 1993). Thyroid cancer affects a wide spectrum of people, ranging from pre pubertal children to octogenarians. Children and adolescents (age <20 years) tend to present with higher-stage disease and greater likelihood of loco regional and distant metastases (Albores-Saavedra *et al.*, 2007). Despite late-stage presentation of tumors, children generally have excellent survival rates; one study found 2% cause-specific mortality at 40 years of follow-up (Alessandri *et al.*, 2000). The best indicator of outcome in this group is response to radioiodine therapy (Alessandri *et al.*, 2000). The incidence of thyroid cancer in women remains steady at about 3-fold that of men. The incidence of PTC is significantly greater than that of FTC and the overall increase in incidence is greater in women than men. The epidemiological features of thyroid cancer are important to clinicians for several reasons. First, PTC is the main cause of the steadily increasing incidence of thyroid cancer, mainly because it comprises about 85% of all thyroid cancers. Second, during the same period, the incidences of FTC and MTC have remained relatively stable in some studies and the incidence of ATC has declined. Finally, perturbations of the incidence and mortality rates relate directly to decisions concerning the diagnosis and treatment of thyroid cancer (Ensami and

Mozaffari, 2001). In comparison to study the detection methods were not changed and this difference in prevalence could not be related to the methods of detection. Study of the SEER database by Mettler *et al.* (1992) found that the incidence of well-differentiated thyroid cancers of all sizes has been increasing in both men and women from 1988 to 2005 and that attributing this change to increased diagnostic activity. Rego-Iraeta *et al.* (2009) reached a similar conclusion in a study in Spain and reported that the increasing incidence of thyroid cancer is due to factors other than increased diagnostic scrutiny and the radiation because tumors of all sizes were increasing at an equal rate.

### CONCLUSION

In conclusion, numerous factors affect outcome for patients with DTC, including age, gender, tumor histology and presence of extra capsular extension, tumor size, presence of lymph node or distant metastases and oncogene expression of the tumor. Mortality rates are significantly higher in men compared with women, largely due to late diagnosis and more advanced disease in men at the time of initial diagnosis.

### REFERENCES

- Akslen, L.A. and V.A. Livolsi, 2000. Increased angiogenesis in papillary thyroid carcinoma but lack of prognostic importance. *Hum. Pathol.*, 31: 439-442.
- Akyildiz, H.Y., J. Mitchell, M. Milas, A. Siperstein and E. Berber, 2010. Laparoscopic radiofrequency thermal ablation of neuroendocrine hepatic metastases: Long-term follow-up. *Surgery*, 148: 1288-1293.
- Al-Sheyyab, M., K.R. Muir, A.H. Cameron, F. Raafat, J.R. Pincott, S.E. Parkes and J.R. Mann, 1993. Malignant epithelial tumours in children: Incidence and aetiology. *Med. Pediatr. Oncol.*, 21: 421-428.
- Albores-Saavedra, J., D.E. Henson, E. Glazer and A.M. Schwartz, 2007. Changing patterns in the incidence and survival of thyroid cancer with follicular phenotype: Papillary, follicular and anaplastic: A morphological and epidemiological study. *Endocr. Pathol.*, 18: 1-7.
- Alessandri, A.J., K.J. Goddard, G.K. Blair, C.J. Fryer and K.R. Schultz, 2000. Age is the major determinant of recurrence in pediatric differentiated thyroid carcinoma. *Med. Pediatr. Oncol.*, 35: 41-46.
- Bullock, M.J., 2010. Encapsulated well-differentiated follicular-patterned thyroid carcinomas do not play a significant role in the fatality rates from thyroid carcinoma. *Am. J. Surg. Pathol.*, 34: 1560-1560.
- Daghigh, M.H., S.H. Safavi and M. Goldust, 2013. Evaluation of magnetic resonance imaging signal changes in vertebral depressed fractures to determine the fracture time. *Pak. J. Biol. Sci.*, 16: 299-300.
- Davies, L. and H.G. Welch, 2006. Increasing incidence of thyroid cancer in the United States, 1973-2002. *JAMA*, 295: 2164-2167.
- Enewold, L., K. Zhu, E. Ron, A.J. Marrogi, A. Stojadinovic, G.E. Peoples and S.S. Devesa, 2009. Rising thyroid cancer incidence in the United States by demographic and tumor characteristics, 1980-2005. *Cancer Epidemiol. Biomarkers Prev.*, 18: 784-791.
- Ensani, F. and K. Mozaffari, 2001. Pathologic study of thyroid nodules in children and young adult population up to 20 years, in cancer institute: Emam Khomeini Medical Complex during the years 1973 to 1997. *TUMG*, 56: 88-93.
- Fardiazar, Z., F. Ronaci, R. Torab and M. Goldust, 2012. Vulvovaginitis candidiasis recurrence during pregnancy. *Pak. J. Biol. Sci.*, 15: 399-402.
- Fardiazar, Z., M. Ramin, E.O.S. Madarek, S. Atashkhouei, R. Torab and M. Goldust, 2013. Complications in premature labor between severe preeclampsia and normal pregnancies. *Pak. J. Biol. Sci.*, 16: 446-450.
- Farhoudi, M., A. Taheraghdam, G. Abbasi Farid, M. Talebi, A. Pashapou, J. Majidi and M. Goldust, 2012. Serum iron and ferritin level in idiopathic Parkinson. *Pak. J. Biol. Sci.*, 15: 1094-1097.
- Ganjpour Sales, J., J. Soleymanpour, A. Sadeghpour, S. Sharifi, S. Rouhani and M. Goldust, 2012. Efficacy of reverse triangle screw fixation in patients suffering from femoral neck fractures. *Pak. J. Biol. Sci.*, 15: 395-398.
- Ganjpour Sales, J., J. Soleymanpour, M. Ansari, F. Afaghi and M. Goldust, 2013. Treatment results of bicondylar tibial fractures using hybrid external fixator. *Pak. J. Biol. Sci.*, 16: 491-495.
- Goforoushan, F., H. Azimi and M. Goldust, 2013. Efficacy of vitamin E to prevent dermal complications of isotretinoin. *Pak. J. Biol. Sci.*, 16: 548-550.
- Goldust, M., F. Goforoushan and E. Rezaee, 2011. Treatment of solar lentigines with trichloroacetic acid 40% vs. cryotherapy. *Eur. J. Dermatol.*, 21: 426-427.
- Goldust, M., E. Rezaee and S. Hemayat, 2012. Treatment of scabies: Comparison of permethrin 5% versus ivermectin. *J. Dermatol.*, 39: 545-547.
- Goldust, M. and E. Rezaee, 2013a. The efficacy of topical ivermectin vs. malation 0.5% lotion for the treatment of scabies. *J. Dermatol. Treat.*, (In Press).

- Goldust, M., E. Rezaee and R. Raghifar, 2013b. Comparison of oral ivermectin versus crotamiton 10% cream in the treatment of scabies. *Cutaneousv Ocul. Toxicol.*
- Goldust, M., M. Talebi, J. Majidi, M.A.R. Saatlou and E. Rezaee, 2013c. Evaluation of antiphospholipid antibodies in youths suffering from cerebral ischemia. *Int. J. Neurosci.*, 123: 209-212.
- Goldust, M., M.R. Ranjkesh, M. Amirinia, F. Golforoushan, E. Rezaee and M.A.R. Saatlou, 2013d. Sertaconazole 2% cream versus hydrocortisone 1% cream in the treatment of seborrheic dermatitis. *J. Dermatol. Treat.*, (In Press).
- Goldust, M., S.B. Nejad, E. Rezaee and R. Raghifar, 2013e. Comparative trial of permethrin 5% vs. lindane 1% for the treatment of scabies. *J. Dermatol. Treat.*, (In Press).
- Golfurushan, F., M. Sadeghi, M. Goldust and N. Yosefi, 2011. Leprosy in Iran: An analysis of 195 cases from 1994-2009. *J. Pak. Med. Assoc.*, 61: 558-561.
- Karzar, S.H., K. Hasanzadeh, M. Goldust and N.H. Karzar, 2012. Intravesical residual urine of patients with benign prostate hyperplasia, Sonography accuracy. *Pak. J. Biol. Sci.*, 15: 1090-1093.
- Lotti, T., M. Goldust and E. Rezaee, 2013. Treatment of seborrheic dermatitis, Comparison of sertaconazole 2% cream vs. ketoconazole 2% cream. *J. Dermatol. Treat.*, 10.3109/09546634.2013.777154
- Martinez, S.R., S.H. Beal, A. Chen, S.L. Chen and P.D. Schneider, 2010. Adjuvant external beam radiation for medullary thyroid carcinoma. *J. Surg. Oncol.*, 102: 175-178.
- Mettler, F.A. Jr., M.R. Williamson, H.D. Royal, J.R. Hurley and F. Khafagi *et al.*, 1992. Thyroid nodules in the population living around chernobyl. *JAMA*, 268: 616-619.
- Milan, P.B., D.M. Nejad, A.A. Ghanbari, J.S. Rad and H.T. Nasrabadi *et al.*, 2011. Effects of Polygonum aviculare herbal extract on sperm parameters after EMF exposure in mouse. *Pak. J. Biol. Sci.*, 14: 720-724.
- Mohebbipour, A., P. Saleh, M. Goldust, M. Amirinia, Y.J. Zadeh, R.M. Mohamadi and E. Rezaee, 2012. Treatment of scabies: Comparison of ivermectin vs. lindane lotion 1%. *Acta Dermatovenerol. Croat.*, 20: 251-255.
- Nehs, M.A., S. Nagarkatti, C. Nucera, R.A. Hodin and S. Parangi, 2010. Thyroidectomy with neoadjuvant PLX4720 extends survival and decreases tumor burden in an orthotopic mouse model of anaplastic thyroid cancer. *Surgery*, 148: 1154-1162.
- Nemati, M., H. Nosratinia, M. Goldust and R. Raghifar, 2013. Arterial injuries in extremities trauma, Angiographic findings. *Pak. J. Biol. Sci.*, 16: 145-147.
- Nikanfar, M., S. Shaafi, M. Hashemilar, D.S. Oskouii and M. Goldust, 2012. Evaluating role of leukocytosis and high sedimentation rate as prognostic factors in acute ischemic cerebral strokes. *Pak. J. Biol. Sci.*, 15: 386-390.
- Nourizadeh, D., A. Houshangi and M. Goldust, 2013. Lich-Gregoir procedure in treatment of the vesicoureteral reflux. *Pak. J. Biol. Sci.*, 16: 426-430.
- Pacini, F., M.G. Castagna, L. Brilli, G. Pentheroudakis and ESMO Guidelines Working Group, 2010. Thyroid cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann. Oncol.*, 21: v214-v219.
- Pezzolla, A., S. Lattarulo, M. Milella, G. Barile and B. Pascazio *et al.*, 2010. [Incidental carcinoma in thyroid pathology: Our experience and review of the literature]. *Ann. Ital. Chir.*, 81: 165-169.
- Qadim, H.H., F. Golforoushan, S.B. Nejad and M. Goldust, 2013. Studying the calcium serum level in patients suffering from psoriasis. *Pak. J. Biol. Sci.*, 16: 291-294.
- Rakotoarisoa, A.H.N., S.A. Ralamboson, R.A. Rakotoarivelo, C.V. Raharisolo and A. Rakouth *et al.*, 2010. Les cancers de la Thyroid cancers in Madagascar. *Bull. Soc. Pathol. Exot.*, 103: 233-337.
- Razi, A., F. Golforoushan, A. Bahrami, S. Babae Nejad and M. Goldust, 2013. Evaluating of dermal symptoms in hypothyroidism and hyperthyroidism. *Pak. J. Biol. Sci.*, 16: 541-544.
- Rego-Iraeta, A., L.F. Perez-Mendez, B. Mantinan and R.V. Garcia-Mayor, 2009. Time trends for thyroid cancer in northwestern Spain: True rise in the incidence of micro and larger forms of papillary thyroid carcinoma. *Thyroid*, 19: 333-340.
- Sadeghpour, A., R. Mansour, H.A. Aghdam and M. Goldust, 2011. Comparison of trans patellar approach and medial parapatellar tendon approach in tibial intramedullary nailing for treatment of tibial fractures. *J. Pak. Med. Assoc.*, 61: 530-533.
- Sadeghpour, A., A. Rouhani, M.A. Mohseni, O.A. Aghdam and M. Goldust, 2012. Evaluation of surgical treatment of developmental dysplasia of hip for avascular necrosis of femoral head in children. *Pak. J. Biol. Sci.*, 15: 391-394.
- Sadighi, A., A. Elmi, M.A. Jafari, V. Sadeghifard and M. Goldust, 2011. Comparison study of therapeutic results of closed tibial shaft fracture with intramedullary nails inserted with and without reaming. *Pak. J. Biol. Sci.*, 14: 950-953.
- Salehi, R., M. Motemavele and M. Goldust, 2012. Risk factors of coronary artery disease in women. *Pak. J. Biol. Sci.*, 16: 195-197.

- Salehi, R., M. Enamzadeh and M. Goldust, 2013a. Study of cognitive disorders in stroke-free patients with a history of atrial fibrillation. *Pak. J. Biol. Sci.*, 16: 44-47.
- Salehi, R., S. Taghavi, S. Imani and M. Goldust, 2013b. Pregnancy in mothers with prosthetic heart valves. *Pak. J. Biol. Sci.*, 16: 421-495.
- Salehi, R., N. Aslanabadi, S. Taghavi, L. Pourafkari, S. Imani and M. Goldust, 2013c. Percutaneous balloon mitral valvotomy during pregnancy. *Pak. J. Biol. Sci.*, 16: 198-200.
- Seyyednejad, F., A. Rezaee, S. Haghi and M. Goldust, 2012. Survey of pre-inflammation cytokines levels in radiotherapy-induced-mucositis. *Pak. J. Biol. Sci.*, 15: 1098-1101.
- Shakeri, A., M. Pourisa, A. Deldar and M. Goldust, 2013. Anatomic variations of Aortic Arch branches and relationship with diameter of Aortic Arch by 64-ROW CT Angiography. *Pak. J. Biol. Sci.*, 16: 496-500.
- Sipos, J.A. and E.L. Mazzaferri, 2010. Thyroid cancer epidemiology and prognostic variables. *Clin. Oncol.*, 22: 395-404.
- Soleimanpour, J., J. Ganjpour, S. Rouhani and M. Goldust, 2013. Comparison of titanium elastic nails with traction and spica cast in treatment of children's femoral shaft fractures. *Pak. J. Biol. Sci.*, 16: 391-395.
- Spiess, H., 2010. Life-span study on late effects of 224Ra in children and adults. *Health Phys.*, 99: 286-291.
- Vafae, I., M.B. Rahbani Nobar and M. Goldust, 2012. Etiology of ocular trauma: A two years cross-sectional study in Tabriz, Iran. *J. Coll. Physicians Surg. Pak.*, 22: 344-344.
- Vahedi, A., R. Estakhri, M.H. Somi, E. Abdollah, M. Goldust and S. Samankan, 2012. Diagnostic value of serum P53 in comparison with tissue P53 in gastric adenocarcinoma and their relationship with microscopic prognostic factors. *Pak. J. Biol. Sci.*, 15: 685-688.
- Yousefi, P., A. Siroos, F. Darreh, M.M. Ahmadi, F.H. Qoran and M. Goldust, 2013. Sacrum index in children suffering from different grades of vesicoureteral reflux. *Pak. J. Biol. Sci.*, 16: 545-547.