Original Article

Trend Analysis of Medicine Consumption Based on Therapeutic Categories in Iran: 2000–2016

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ABSTRACT

Objective: Iranian healthcare system cost has been remarkably growing during the recent decades. Drug shortages and the economic effects of the sanctions have also exposed the pitfalls and shortcomings of the pharmaceutical system. Moreover, the pharmaceutical system is a major expenditure source for the health system. Pharmaceutical market trend analysis serves as a reliable tool to gather and analyze market and consumption data to take account of the past policies and forecast the future of the market and disease trends. **Methods:** The present work tries to quantitatively describe and analyze past 17 years of Iranian pharmaceutical market sales data from 2000 to 2016. The anatomical therapeutic chemical-classified drug utilization data obtained from the Iranian Food and Drug Administration were used to analyze the market trends for each therapeutic class and categorize them. **Findings:** The size of Iranian pharmaceutical market has grown dramatically during the last 5 years reaching to $5.183 billion in 2016 from $3.847 billion in 2011 with a compound annual growth rate of 6.14%. Antidiabetics and antineoplastic agents were one of the most prominent market growth drivers. Introduction of new drug molecules to the market has also contributed to the trend. However, the noncommunicable diseases are gaining momentum in the national disease burden. **Conclusion:** The market growth necessitates policies to prevent the overwhelming cost burden on the healthcare system which in turn requires well-informed decision-making. Pharmaceutical market trend analysis tries to supply the evidence feed for informed policy-making to forecast, prioritize, and contain the cost burden imposed on the healthcare system by the pharmaceutical sector.

Keywords: *Anatomical therapeutic chemical categories, market dynamics, forecasting, pharmaceutical market, trend analysis*

Introduction

Iran is the second most populated country in the Middle East and North Africa region after Egypt, with 80.28 million population in 2016, also being the second largest economy in this region after Saudi Arabia with an estimated gross domestic product (GDP) of $412.2 billion in 2016.[1]

Nearly 6.9% of the GDP has been spent on the healthcare in 2014 that is close to Tunisia (7.0%) and Lebanon (6.4%).[1,2] The public sector accounted for 41% of total healthcare expenditure while the private sector accounted for 59% of health expenditure. The health expenditure per capita (in current US$) is US$351 which is close to that of Jordan (US$359) and Algeria (US$359). About 12.7% of health expenditure is allocated to pharmaceutical sector.[1,3]

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The challenge of growing health sector expenditure on medicines is a top priority for some developing countries to tackle. The counteracting interests of players in the pharmaceutical sector embedded in a larger and highly regulated healthcare market make the implementation of a range of cost containment policies a rational choice.[4]

Iranian pharmaceutical market has undergone a couple of significant ups and downs in the past two decades, for example, governmental financial support policies, national currency devaluation, extensive drug shortages, sanctions, and healthcare system reform. However, despite political pressures and inevitable economic liberation of the pharmaceutical industry to domestic private sector and also multinational entities, the domestic market is protected from globalization and competition forces by tariff and regulatory measures. Although it is not believed to sustain for long, there is still a predominant governmental control over the market. Drug shortages and market forces have worked together to shape the pharmaceutical market evolution which makes it an incredible case study for the transforming markets in developing countries.[4,5]

Trend analysis study on the pharmaceutical market contributes significantly to our understanding of drug consumption dynamics, communicable and noncommunicable disease (NCDs) epidemiological variations which shape the foundation of the pharmacoepidemiologic studies. However, to the best our knowledge, there is a wide knowledge gap in this field that could be overcome with such studies. Consumption trend analysis helps decipher the time variability of the diseases in the country, employing the drug consumption as a surrogate variable for the disease prevalence.[6]

Therefore, these studies could assist health and pharmaceutical policymakers to optimally draw a picture of the future, prioritize, and allocate resources accordingly by providing them with market dynamics through statistical inference.

The current study updates and expands the realm of the trend analysis of the Iranian pharmaceutical market and details the medicines use in Iran 2000–2016. It tries to figure out if there has been any significant change in the therapeutic classes during the past 17 years. Thereafter, we would consider forecasting the future of therapeutic classes in the next 5 years based on the consumption data.

Methods

This research is a descriptive, cross-sectional study that tries to quantitatively investigate the past 17 years of Iranian pharmaceutical market from 2000 to 2016, adjusted by the time series data availability in each case. This study is performed pursuant to and as a complimentary update of another study done in 2013.[4]

The drug utilization data classified based on the anatomical therapeutic chemical (ATC) classification methodology that is developed and maintained by the World Health Organization (WHO) Collaborating Center for Drug Statistics Methodology were obtained from the Iranian Food and Drugs Administration (IFDA).[7] This classification methodology was adopted in this study to serve as a tool for the drug utilization research. ATC codes classify active pharmaceutical substances according to their main indication of use and chemical characteristics. The classification consists of five levels with anatomical main group and therapeutic subgroup as the first and second levels and specific active substances as the fifth level.[8]

In this study about 3300 different dosage forms of around 1400 drug molecules available in the Iran drug list (IDL) were classified based on their respective ATC codes.

Sales values are presented in US Dollar following the official exchange rate released by the Central Bank of Iran which is the official currency exchange rate used in the pharmaceutical industry.[9]

Microsoft Excel was used to analyze the sales data. However, the accuracy of the consumption data remains under scrutiny since the accessible data are merely based on the sale values by the distributors to retail pharmacies and might not utterly correlate with the consumption. To the best of our knowledge, a realistic consumption data source is lacking, and therefore, the assumption was that the distributors to retail pharmacies' sale values are an acceptable surrogate for consumption and utilization. In addition, most available articles published on the drug consumption have also supposed a relatively similar approach for the consumption approximation to explore the real consumption rate in the patient population. Six different statistical forecasting models including linear, exponential, polynomial (order 2 and order 3), logarithmic, moving average, and compound annual growth rate (CAGR) for the periods of the last 3, 5, or 10 years ending at 2016 have been employed in this study. A panel of eight pharmaceutical market experts selected the appropriate pattern of medicine consumption for each ATC group to find the best retrospective and futuristic data fitting and forecast approach through to 2022. The expert panel members included business, marketing, and executive managers of some major pharmaceutical companies, policymakers, and pharmacoeconomics professors, who had actively participated in the pharmaceutical market

practices in the past 10 years, based on a purposive sampling until the attainment of saturation in the ideas. However, for some participants, the expertise may have some overlap because of their diversity of involvements. They employed their experience and publications on the Iranian pharmaceutical market to attain a reliable estimation method based on specific dynamics and behavior of various market segments. Having selected the best forecasting model, the expert panel and the researchers tried to rank the classes based on their attractiveness. Three different criteria were selected for the demonstration of results which included actual CAGR (2011–2016), forecasted CAGR (2017–2022), and average market share (2014–2016).

$$\text{CAGR}_{(t_0,t_n)}=\left(\frac{\text{value}(t_n)}{\text{value}(t_0)}\right)^{\frac{1}{t_n-t_0}}-1$$

This attractivity ranking is contemplated as a market attractivity driving force to help predict the trends of each therapeutic class, assuming that the most attractive classes will take the market growth lead.

Results

The Iranian pharmaceutical market size has grown dramatically during the last 5 years. According to the annual statistical datasheet published by the IFDA under the Ministry of Health and Medical Education, the market size has grown from $3.847 billion in 2011 to $5.183 billion in 2016, showing a steep annual growth rate during the last 5 years ($CAGR_{2011–2016}=6.14\%$).

Financially, the market share of the private sector (private pharmaceutical importer and manufacturer) has increased from 43% in 2000 to 67% in 2016 against the public sector. The market share of the domestic production had shrunk from 85% in 2000 to 60% in 2010 and increased back again to 70% in 2016.

During the recent 5 years (2012–2016), 144 new molecular entities in 461 different stock keeping units have been added into the IDL. Among the 14 anatomical main groups, anti-infective medicines for systemic use, alimentary tract and metabolism (including drugs used in diabetes), antineoplastic and immunomodulating agents, nervous system, and blood and blood-forming organs have contributed the most with 25, 22, 18, 15, and 12 new molecules, respectively.

Alimentary tract and metabolism (including drugs used in diabetes), antineoplastic and immunomodulating agents, blood and blood-forming organs, nervous system, and anti-infectives for systemic use were the main growth drivers of the Iranian pharmaceutical market (2011–2016) contributing $371, $237, $218, $188, and $95 million to the increase in overall sales, respectively [Figure 1 and Table 1].

The Iranian pharmaceutical market is projected to grow 6.6% annually over the next 5-year period (2017–2022), which would exceed the last 5 years ($CAGR_{2011–2016}$) by 0.5% reaching $7.857 billion by 2022 [Figure 2].

We categorized the ATC groups into four types based on their past (actual) and future (forecasted) annual growth rates and their market positioning [Figure 3]. We address the first top ten groups and leave the rest such as antiparasitic products, insecticides, and repellents group.

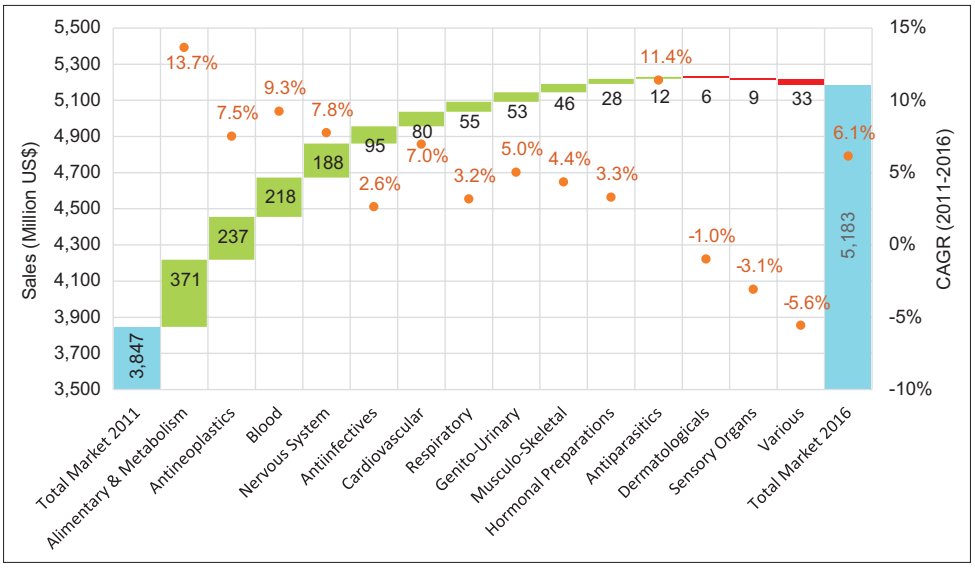

Figure 1: Iranian market value growth drivers share for anatomical therapeutic chemical groups ($ millions) and respective compound annual growth rate (%); 2011–2016

Table 1: Ranking of the market share of main anatomical therapeutic chemical groups in 2016 compared to 2011, recent 5 years compound annual growth rates and market share change

Anatomical main group	Sales (million US$)		CAGR (%)	Market share (%)				Market share change (%)	Ranking change
	2011	2016	2011-2016	2011	Rank	2016	Rank	2011-2016	2011-2016
Alimentary and Metabolism	413	784	13.7	10.7	4	15.1	1	4.4	+3
Antineoplastics	543	780	7.5	14.1	2	15.0	2	0.9	0
Antiinfectives	682	778	2.6	17.7	1	15.0	3	−2.7	−2
Blood	391	609	9.3	10.2	5	11.8	4	1.6	+1
Nervous system	415	603	7.8	10.8	3	11.6	5	0.9	−2
Respiratory	324	378	3.2	8.4	6	7.3	6	−1.1	0
Cardiovascular	201	281	7.0	5.2	7	5.4	7	0.2	0
Genito-urinary	191	244	5.0	5.0	9	4.7	8	−0.3	+1
Musculo-skeletal	194	240	4.4	5.0	8	4.6	9	−0.4	−1
Hormonal preparations	157	185	3.3	4.1	10	3.6	10	−0.5	0
Dermatologicals	127	121	−1.0	3.3	12	2.3	11	−1.0	+1
Sensory organs	63	54	−3.1	1.6	13	1.0	12	−0.6	+1
Antiparasitics	16	28	11.4	0.4	14	0.5	13	0.1	+1
Various	131	98	−5.6	3.4	11	1.9	-	−1.5	-
Total market	3,847	5,183	6.1	100	-	100	-	-	-

CAGR=Compound annual growth rate

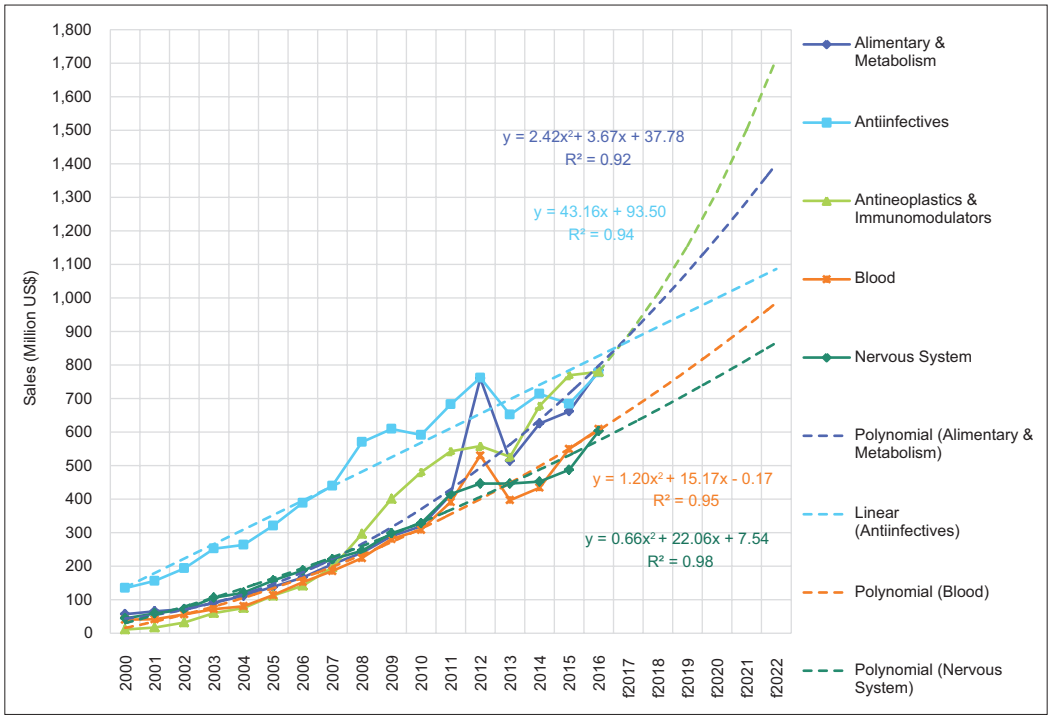

Figure 2: Sales trend of the top five anatomical therapeutic chemical groups 2000–2016 and outlook to 2022. f: forecast

Type 1: Groups with past and future growth rates higher than the overall market average: Alimentary tract and metabolism (including drugs used in diabetes), antineoplastic and immunomodulating agents, blood and blood-forming organs, nervous system, and cardiovascular system

Alimentary tract and metabolism (including drugs used in diabetes) has been the largest ATC group with the market value of $784.4 million and the market share of 15.1% in 2016. This group has been the fastest-growing group with a $CAGR_{2011–2016}$ of 13.7% which is 7.6% higher than the market average. It is also anticipated that this group would be the third fastest-growing group in 2017–2022 with the $CAGR_{2017–2022}$ of 9.6%, 3.0% higher than the market average.

This ATC group encompasses 16 therapeutic subgroups. Drugs used in diabetes and drugs for acid-related disorders are the dominant groups with 36.5% and 25.3% share in 2016, respectively, while drugs used in

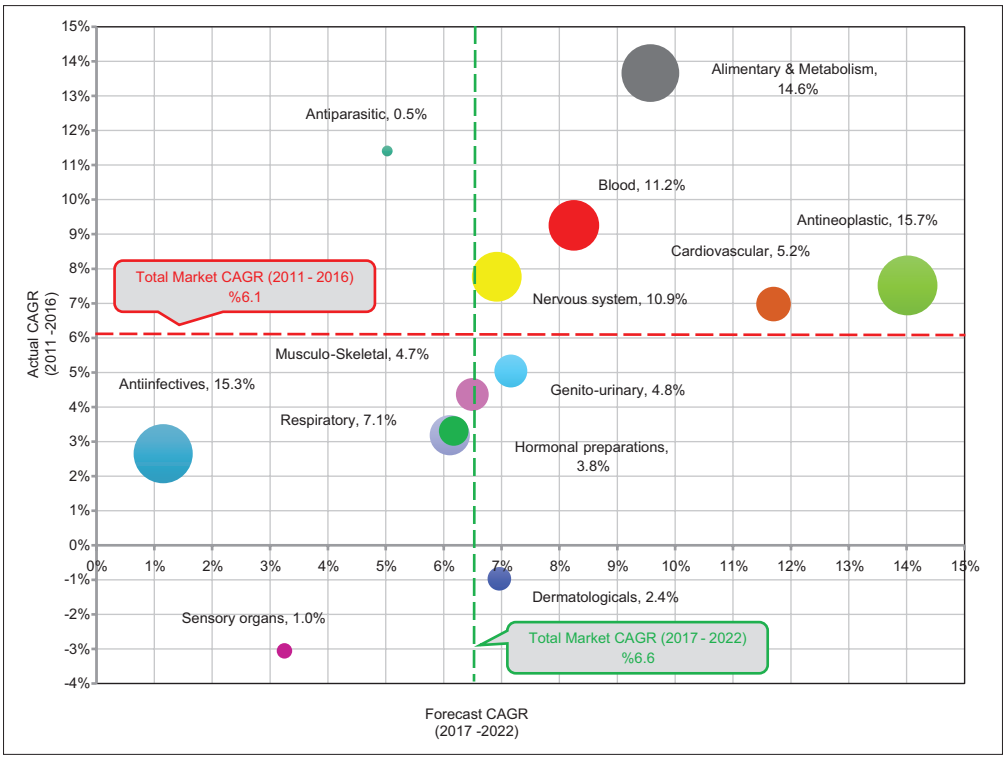

Figure 3: The positioning of anatomical therapeutic chemical groups based on their actual annual growth rate (2011-2016) and their forecasted annual growth rate (2017-2022) with regard to the actual and forecasted annual growth rate of the total market. Circle size showing the relative market share (%) in the last 3 years

diabetes have been the second fast-growing subgroup with a $CAGR_{2011–2016}$ of 30.1%. The best sellers of this ATC group in 2016 were insulin aspart 300 IU/3 ml prefilled pen, insulin glargine 300 IU/3 ml prefilled pen, metformin 500 mg tablet, pantoprazole 40 mg for infusion, and omeprazole 20 mg capsule.

Antineoplastic and immunomodulating agents has been the second largest group with the market value of $779.7 million and the market share of 15.04% in 2016 with the $CAGR_{2011–2016}$ of 7.5%, i.e. 1.4% higher than the market average. It is also estimated to be the fastest-growing group 2017–2022 period with the $CAGR_{2017–2022}$ = 14.0%, which would be 7.4% more than the market average.

This ATC group includes four therapeutic groups: antineoplastic agents, immunostimulants, immunosuppressants and endocrine therapy, with the value shares of 48.7%, 22.3%, 22.3%, and 6.7% in 2016, respectively. Immunosuppressants has been the fastest-growing subgroup with the $CAGR_{2011–2016}$ of 24.9%.

Trastuzumab 440 mg injection, bevacizumab 400 mg injection, interferon β_1-A 30 mcg injection, interferon β_1-A 44 mcg injection, infliximab 100 mg injection, and rituximab 500 mg injection have been the top sellers in 2016.

Blood and blood-forming organs has been the fourth largest group in 2016, with the market value of $609.1 million and the market share of 11.8%. It has shown a $CAGR_{2011–2016}$ of 9.3% (3.2% more than the market average), projected to be the fourth fast-growing group in 2017–2022 period with the $CAGR_{2017–2022}$ of 8.2% (1.6% lead over the market average).

This main group includes five therapeutic subgroups: blood substitutes and perfusion solutions, antithrombotic agents, antihemorrhagics, antianemic preparations, and other hematological agents. The first two therapeutic subgroups were the largest subgroups in 2016 with the share value of 38.5% and 33.9%, respectively. Antihemorrhagics were the only subgroup to have grown more than the group average with $CAGR_{2011–2016}$ of 83.5%.

In 2016, clopidogrel 75 mg tablet, albumin (human) 20%, 50 ml injection, enoxaparin 100 mg/ml, 0.4 ml injection, antihemophilic factor VIII 500 IU injection, and sodium chloride 0.9%, 0.5 L infusion have been the top sellers.

Nervous system ATC group was the fifth largest group in 2016 with the market value of $603.1 million and market share of 11.6% with $CAGR_{2011–2016}$ = 7.8% (1.7% more than the market average projected to reach $CAGR_{2017–2022}$ of 6.9% that is close to the forecasted average of the total market).

This main group consists of seven therapeutic subgroups: analgesics, antiepileptics, psychoanaleptics, psycholeptics, anesthetics, antiparkinson drugs, and other nervous system drugs. Analgesics subgroup was the leader not only value-wise with 29.7% but also in terms of growth rate with the $CAGR_{2011–2016}$ = 11.82%. Antiepileptics subgroup has been the second largest subgroup with 22.1% share and the third subgroup in terms of annual growth rate with the $CAGR_{2011–2016}$ = 8.8%. Psychoanaleptics and psycholeptics subgroups have been the third and fourth subgroups in terms of value share with the share of 17.1% and 10.2%, respectively, but their $CAGR_{2011–2016}$ was less than the group average.

Acetaminophen/caffeine/ibuprofen 325/40/200 mg capsule, buprenorphine 2 mg sublingual tablet, valproate sodium 500 mg tablet, methadone 250 mg/5 ml, 250 ml oral solution, sertraline HCl 50 mg tablet, and acetaminophen/codeine 300/20 mg tablet have been the group top sellers in 2016.

Cardiovascular system has been the seventh largest group with the market value of $281.0 million and the market share of 5.4% in 2016. It had a $CAGR_{2011–2016}$ = 7.0% (0.9% more than the market average), but this group is expected to be the second fastest-growing group in 2017–2022 ($CAGR_{2017–2022}$ = 11.7% and 5.1% higher than the market average).

This ATC group comprises nine therapeutic subgroups among which lipid-modifying agents and agents acting on the renin-angiotensin system are the largest groups with 26.5% and 25.4% share in 2016, respectively. Agents acting on the renin-angiotensin system, antihypertensives, and diuretics grew faster than the group average with the $CAGR_{2011–2016}$ of 12.9%, 10.4%, and 10.2%, respectively.

In 2016, the top-selling preparations were atorvastatin 20 mg tablet, losartan potassium 25 mg tablet, valsartan 80 mg tablet, amlodipine 5 mg tablet, and metoprolol tartrate 50 mg tablet.

Type 2: Groups with past and future growth rates lower than the overall market average: Anti-infectives for systemic use, respiratory system, musculoskeletal system, systemic hormonal preparations, excluding sex hormones and insulins, and sensory organs

Anti-infectives for systemic use has been the third largest ATC group with the market value of $777.7 million in 2016 and the market share of 15.01%. However, it has assumed one of the lowest annual growth rates with the $CAGR_{2011–2016}$ of 2.6% which is 3.5% lower than the market average. In addition, its annual growth rate is estimated to be the lowest in this group with the $CAGR_{2017–2022}$ of 1.2%, i.e. 5.4% lower than the market average.

This ATC group consists of six therapeutic groups. In 2016, antibacterials for systemic use and immune sera and immunoglobulins were the largest groups with 79.4% and 11.3% respective shares within the group. Antimycotics for systemic use, immune sera and immunoglobulins, and antivirals for systemic use experienced a growth rate higher than the market average with the $CAGR_{2011–2016}$ of 25.0%, 11.5%, and 9.4%, respectively. The top sellers of this ATC group were amoxicillin 500 mg capsule, immune globulin 5 g injection, cefixime 400 mg tablet, co-amoxiclav 625 mg tablet, and meropenem 1 g injection.

Respiratory system has been the sixth largest ATC group with the market value of $378.4 million and the market share of 7.3% in 2016 with an annual growth rate 2.9% lower than the market average ($CAGR_{2011–2016}$ = 3.2%). It is also expected to have a modest annual growth rate ($CAGR_{2017–2022}$ of 6.1%, i.e. 0.5% lower than the market average).

This ATC group includes six therapeutic subgroups. Drugs for obstructive airway diseases, cough and cold preparations, and antihistamines for systemic use are dominant subgroups with 35.8%, 27.8%, and 26.4% in 2016, respectively. Drugs for obstructive airway diseases, other respiratory system products, and antihistamines for systemic use showed higher growth rate than the group average with the $CAGR_{2011–2016}$ of 8.3%, 7.4%, and 4.4%, respectively.

In 2016, respiratory system top-selling products were adult cold tablet, salbutamol sulfate 100 mcg/dose 200 dose inhaler, salmeterol/fluticasone 25/250 mcg/dose inhaler, budesonide/formoterol 320/9 mcg/dose inhaler, and ketotifen fumarate 1 mg/5 ml, 120 ml syrup.

Musculoskeletal system ATC group has been one of the smallest groups (9th rank) in 2016 with the market value of $240.1 million and 4.6% share of the total market with an annual growth lower than the market average ($CAGR_{2011–2016}$ = 4.4%) which is projected to show lower growth compared to the market average ($CAGR_{2017–2022}$ = 6.5%).

Anti-inflammatory and antirheumatic products, topical products for joint and muscular pain, muscle relaxants, antigout preparations, drugs for treatment of bone diseases, and other drugs for disorders of the musculoskeletal system are the therapeutic subgroups of this ATC group. Anti-inflammatory and antirheumatic products have had 73% of the total sales in 2016 and antigout preparations have been the fastest-growing subgroup with $CAGR_{2011–2016}$ of 16.7%.

In 2016, ibuprofen 400 mg softgel, diclofenac sodium 100 mg SR tablet, ibuprofen 100 mg/5 ml suspension, diclofenac sodium 100 mg suppository, ketorolac 30 mg/ml injection, and celecoxib 200 mg capsule were the top-selling preparations of this group.

Systemic hormonal preparations, excluding sex hormones and insulins, have had one of the smallest markets among all ATC groups (10th rank) with the value of $184.6 million and the share of 3.6% in 2016. It has shown a very low annual growth rate with the $CAGR_{2011–2016}$ of 3.3% (2.8% lower than the market average). It is forecasted that this class would have a moderate annual growth rate with the $CAGR_{2017–2022}$ of 6.2% which is 0.4% lower than the market average.

This ATC group consists of five therapeutic groups. Pituitary and hypothalamic hormones and analogs and corticosteroids for systemic use are the largest groups with 46.4% and 33.8% share in 2016. Thyroid therapy and calcium homeostasis have the highest growth rates in this group with the $CAGR_{2011–2016}$ of 23.6% and 16.3%, respectively.

The best seller drugs in this group in 2016 were somatropin 5 mg/1.5 ml pen, levothyroxine sodium 0.1 mg tablet, and dexamethasone 8 mg/2 ml ampoule.

Type 3: Groups with previously higher growth rates, but lower future growth rates compared to the market average: Antiparasitic products, insecticides, and repellents

This type of therapeutic classes has had the smallest sales market among all the other groups in 2016 ($28 million). Antiprotozoals comprised the major share of the group sales with about 70.1%. They are forecasted to rank the last sales in 2022.

Type 4: Groups with lower growth rate in the past, but higher growth rate in the future, with regard to the market average: Genitourinary system and sex hormones and dermatologicals

Genitourinary system and sex hormones have been one of the smallest main groups (8th rank) with the market value of $244.0 million and the market share of 4.7% in 2016. Its annual growth rate has been fairly low with the $CAGR_{2011–2016}$ of 5.0%, i.e. 1.1% lower than the market average. Its annual growth rate is also projected to be moderate with the $CAGR_{2017–2022}$ of 7.2%, 0.6% higher than the market average.

This ATC main group comprises four therapeutic groups. Sex hormones and modulators of the genital system and urologicals are the largest groups with 57.6% and 34.1% shares in 2016. Urologicals have a higher growth rate than the group average with the $CAGR_{2011–2016}$ of 8.1%.

In 2016, the top-selling preparations in this main group were tamsulosin 0.4 mg capsule, menotropins 75 IU FSH + 75 IU LH ampoule, and sildenafil citrate 100 mg tablet.

Discussion

Trend analysis of the Iranian pharmaceutical market shows that the market is growing significantly and its CAGR is estimated to be twice that of the global market.[2,10-12] The market share of antineoplastic and immunomodulating agents, alimentary tract and metabolism medicines (including drugs used in diabetes), blood and blood-forming organs, and nervous system medicines may expand quickly and their cumulative market share will reach 60% from 54% of the whole market. The main drivers of this growth will be:

1. Monoclonal antibodies and protein kinase inhibitors from the antineoplastic agents therapeutic subgroup
2. Tumor-necrosis-factor alpha inhibitors from the immunosuppressants therapeutic subgroup of the antineoplastic and immunomodulating agents ATC group
3. Insulins and analogs (especially novel insulin preparations) and new classes of oral blood-glucose-lowering drugs from the drugs used in diabetes therapeutic subgroup of alimentary tract and metabolism ATC group
4. Direct thrombin inhibitors and enzymes from the antithrombotic agent's therapeutic subgroup of the blood and blood-forming organs ATC group
5. Newly introduced classes in the nervous system ATC group.

The observed trend in the market segments implies certain underlying market forces. Alimentary tract and metabolism (including drugs used in diabetes) have been the largest and the fastest-growing ATC group in type 1 category. This observation coincides with the vast public health awareness and introduction of new generic antidiabetics.[13-15]

"Antineoplastic and immunomodulating agents" is a specific group in the sense, they have been a major target of the price control policies enforced by the IFDA which generally works toward market suppression by preventing prices to ratchet up; however, it has been the fastest-growing group in this period with similar growth forecast. This forecast is in line with the global projection that this class would be the leading ATC group in terms of growth with the $CAGR_{2017–2022} = 12.7\%$.[16] Blood and blood-forming organs ATC group represents another policy target. Noteworthy, some of the hemophilic products were removed from the governmental subsidy list, which has affected the market value by the pursuant price increase.[17] Cardiovascular system is expected to

be the second fastest-growing group in 2017–2022. According to the WHO, in 2014, cardiovascular diseases were the leading cause of death in Iran and account for an estimated 46% of all NCDs deaths.[18] The forecasts also mention the growing role of cardiovascular diseases in the health system costs.[19]

Another expected trend relates to the anti-infectives for systemic use that has one of the lowest annual growth rates and forecasted growth. This might show the shift of the burden of diseases in Iran from communicable diseases to NCDs in the future and efforts by the Ministry of Health to promote rational use of drugs specifically antibiotics and glucocorticoids.[20] In addition, musculoskeletal system ATC group has been a very small group which might be related to the scarcity of new generic formulations and dosage forms. However, recent registration of some new products in the IDL may prompt its market to expand in the midterm.[21,22]

Antiparasitic products, insecticides, and repellents therapeutic class has experienced a diminishing market share during the past years. This trend is consistent with the fact that the prevalence of parasitic and insect-borne diseases has decreased with the enforcement of the public hygiene measures through environmental and health protection programs which constitute a national initiative along with the social determinants of health program.[23]

Genitourinary system and sex hormones have been one of the smallest main groups with low annual growth rate but its forecast higher than the market average. This represents the diminished use of oral contraceptive pills due to governmental pro-growth population policy. However, new urological generic products have been launched and may affect size of the market in the future. On the other hand, the population growth policies have not been stable and population growth promoting programs have not been enforced fully in the last few years.[24]

However, not all the trends necessarily comply with the expectations. For example, respiratory system drugs annual growth rate has been lower than the market average which could imply that the prevalence of respiratory tract diseases had remained steady while the possibility of the market expansion due to active and passive smoking and air pollution crisis in the major cities has faded away.[25]

The statistical datasheet that was the basis for this study contains sales data for the past 17 years originating from sales by the distribution companies to the retail pharmacies. Counterparts of such database can hardly be found in the developing countries. It is published under supervision of the IFDA and contains the sales data by value and numbers based on generic names, suppliers, and distribution companies. However, this database faces distinct shortcomings including data for some years are faulty, it just shows the distributor-to-pharmacy sales and not real consumption, and the data do not comprise sales data for the preparations which Ministry of Health purchases and distributes to the end users such as vaccines and antiretrovirals.

As the results show, the Iranian pharmaceutical market has experienced a high growth rate during past one and a half decade. Accordingly, the analysis of the trends can explain a significant portion of the market variability which is backed by the epidemiological evidence. The market growth signals the need for policies to implement evidence-based medicine, sustainable price control policies, optimized cost reimbursement, and efficient and timely diagnostic and preventive measures for NCDs as evidenced by the epidemiologic shift in burden of diseases.[26,27] With such policies and plan of action in place, the pharmaceutical sector expenditure imposed on the healthcare system could be contained.[28] In fact, pharmaceutical market trend analysis provides the feed for informed policy-making and benchmark studies. As the results denote, it could be advisable to investigate each ATC group with further details to find the trend and underlying growth drivers. Consequently, further investigation of the therapeutic groups can help understand the detailed underlying market dynamics for each market segment so that the policies are adjusted according to the factual evidence.

Authors' Contribution

Alireza Yektadoost: research design and manuscript preparation. Farid Ebrahimi: data acquisition. Mohammadreza Mashouf: statistical analysis. Naghmeh Hadidi: literature search. Nasser Nassiri Koopaei: manuscript preparation and editing. Abbas Kebriaeezadeh: manuscript review, supervisor and guarantor.

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Conflicts of interest

There are no conflicts of interest.

References

1. Iran Overview. The World Bank in Islamic Republic of Iran. Available from: http://www.worldbank.org/en/country/iran/overview. [Last accessed on 2017 Apr 06].
2. Abdollahias A, Nikfar S, Abdollahi M. Pharmaceutical market and health system in the Middle Eastern and Central Asian

countries: Time for innovations and changes in policies and actions. Arch Med Sci 2011;7:365-7.
3. Iran Healthcare System Expenditure Data. Statistical Center of Iran. Available from: https://www.amar.org.ir/. [Last accessed on 2017 Feb 17].
4. Kebriaeezadeh A, Koopaei NN, Abdollahiasl A, Nikfar S, Mohamadi N. Trend analysis of the pharmaceutical market in Iran; 1997-2010; policy implications for developing countries. Daru J Pharm Sci 2013;21:52.
5. Davari M, Walley T, Haycox A. Pharmaceutical policy and market in Iran: Past experiences and future challenges. J Pharm Health Serv Res 2011;2:47-52.
6. Varmaghani M, Farzadfar F, Sharifi F, Rashidian A, Moin M, Moradi-Lakeh M, *et al.* Prevalence of asthma, COPD, and chronic bronchitis in Iran: A systematic review and meta-analysis. Iran J Allergy Asthma Immunol 2016;15:93-104.
7. WHO ATC Index. Available from: https://www.whocc.no/atc_ddd_index/. [Last accessed on 2017 Jan 23].
8. Ronning M. A historical overview of the ATC/DDD methodology. WHO Drug Inf 2002;16:233.
9. Currency Exchange Rate. Central Bank of Iran. Available from: http://www.cbi.ir/. [Last accessed on 2017 Nov 01].
10. Dinarvand R. New national drug policy in Iran leading to expanded pharmaceutical market and extended access of public to medicines. Iran J Public Health 2009;38:158-61.
11. Cheraghali AM. Current status of biopharmaceuticals in Iran's pharmaceutical market. Generics Biosimilars Initiative J 2013;2:26-31.
12. Cheraghali AM. Trends in Iran pharmaceutical market. Iran J Pharm Res 2017;16:1-7.
13. Crump C, Sundquist K, Sundquist J, Winkleby MA. Neighborhood deprivation and psychiatric medication prescription: A Swedish national multilevel study. Ann Epidemiol 2011;21:231-7.
14. Laius O, Maasalu K, Kõks S, Märtson A. Use of drugs against osteoporosis in the Baltic countries during 2010-2014. Medicina (Kaunas) 2016;52:315-20.
15. Dadfar H, Dahlgaard JJ, Brege S, Alamirhoor A. Linkage between organisational innovation capability, product platform development and performance: The case of pharmaceutical small and medium enterprises in Iran. Total Qual Manag Bus 2013;24:819-34.
16. Mohammadi S, Norimah AK, Abd Talib R, Amani R. Knowledge, attitude and practices on diabetes among type 2 diabetic patients in Iran: A cross-sectional study. Science 2015;3:520-4.
17. Cheraghali AM, Aboofazeli R. Economical impact of plasma fractionation project in Iran on affordability of plasma-derived medicines. Transfus Med 2009;19:363-8.
18. World Health Organization. Noncommunicable Diseases (NCD) Country Profiles, 2014. Geneva: WHO Library Cataloguing-in-Publication Data; 2014.
19. Pharma E. World Preview 2014, Outlook to 2020. Available from: http://www, evaluategroup.eorrt/publie/Reports/EvaluatePharma-World-Preview-2014.aspx2014. [Last accessed on 2014 May 11].
20. Saadat S, Yousefifard M, Asady H, Moghadas Jafari A, Fayaz M, Hosseini M, *et al.* The most important causes of death in Iranian population; a retrospective cohort study. Emergency (Tehran) 2015;3:16-21.
21. Mastorakis K, Siskos E. Value focused pharmaceutical strategy determination with multicriteria decision analysis techniques. Omega 2016;59:84-96.
22. Akhavan P, Mehralian G, Rasekh H, Sadeh M. The impact of intellectual capital efficiency on market value: An Empirical Study from Iranian Pharmaceutical Companies. IJPR 2012;11:195-207.
23. Forouzanfar MH, Sepanlou SG, Shahraz S, Dicker D, Naghavi P, Pourmalek F, *et al.* Evaluating causes of death and morbidity in Iran, global burden of diseases, injuries, and risk factors study 2010. Arch Iran Med 2014;17:304-20.
24. Shabaninejad H, Mehralian G, Rashidian A, Baratimarnani A, Rasekh HR. Identifying and prioritizing industry-level competitiveness factors: Evidence from pharmaceutical market. Daru 2014;22:35.
25. Rokni MB. The present status of human helminthic diseases in Iran. Ann Trop Med Parasitol 2008;102:283-95.
26. Naddafi K, Hassanvand MS, Yunesian M, Momeniha F, Nabizadeh R, Faridi S, *et al.* Health impact assessment of air pollution in megacity of Tehran, Iran. Iranian J Environ Health Sci Eng 2012;9:28.
27. Folino-Gallo P, Walley T, Frolich JC, Carvajal A, Edwards IR. Availability of medicines in the European Union: Results from the EURO-medicines project. Eur J Clin Pharmacol 2001;57:441-6.
28. Cheraghali AM. Iran pharmaceutical market. IJPR 2006;5:1-7.