Extent of potential drug in
patients receiving anti-h
medications

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ABSTRACT

Objective: To investigate the extent of potential drug interactions among patients with antihypertensive drug interactions among patients with cardiovascular diseases receiving antihypertensive medications.

Methods: The study took place in Palestine starting April through October 2003. Patients with cardiovascular diseases (n= 8 evaluated. All drugs prescribed obtained from their medical database was developed based Interaction Facts to examine interactions in each patient's and analyzed using SPSS software.

Results: The number of "unique"

Conclusions:

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A large number of anti-hypertensive drugs are introduced every year, and physicians interactions between medications leading to increased risk of adverse Multiple drug regimens used to complicated hypertension adverse interactions. A when the effects of one drug effects of another drug. This increased or decreased effects Palestine, the health system individual skills to identify interactions. No software is governmental health centers

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Methods. The study was [illegible] Nablus district, the largest district in [illegible] population of 325,269 inhabitants. [illegible] patients' medical files was made after permission of the Palestinian health authorities. The permission was given to researchers [illegible] university officials. The health authorities assigned a pharmacist in each governmental [illegible] technical help to the researchers. [illegible] cardiovascular diseases [illegible] receiving one or more antihypertensive medications were evaluated. These files were selected randomly from the 4 governmental outpatient primary health care centers in Nablus district in north Palestine. The 4 centers are: Al-Mak[illegible] Center, Al-Wosta Center, Al-Garbehe and [illegible] Centers. These centers were run by both specialists and general practitioners. These health care centers provide primary medical health services [illegible] registered at the Ministry of Health (MOH) as chronic patients and who dispense their medications on a regular basis. In each primary health care center, every other file was obtained and [illegible] belonged to a patient with a cardiovascular disease, it was considered part of the study. Files that belong to patients suffering from non-cardiovascular diseases were not taken for the study. The total number of files present at the 4 centers where the study took place was more than 8000 files. Eight hundred and seventy-six randomly selected medical files fit the criteria and were considered for the study. The criteria were as follows: 1. The patient has been using the prescribed medication for at least 6 months; 2. The medication profile contains at least one of the drugs that belong to the antihypertensive agents; 3. The patient is treated on [illegible] basis and, finally, 4. The patient is diagnosed with one or more cardiovascular diseases such as congestive heart disease, hypertension, ischemic heart diseases, or arrhythmias. [illegible] the data regarding age, gender, drug history, drugs prescribed for the patient and the prescribing physician was obtained and analyzed using (SPSS) version 10. The reference [illegible] interactions was the updated [illegible] Facts.[12] A list of all antihypertensive medications was generated and categorized [illegible] A database was created [illegible] interacting drug pair [illegible] interacting drug) and the significance of [illegible] interaction. The significance [illegible] rated from one through 5 as [illegible] Interaction – Facts and Comparison [illegible] used as a classification reference [illegible] major, 2 = moderate, 3 = minor [illegible] or 3 could be of suspected [illegible] interaction), 4 = major/moderate [illegible] documentation of the interaction [illegible] minor and possible documentation [illegible]

[illegible]

Table 1 - Percentage of patients with potential drug interactions by age and gende

Patient characteristics		Frequency of interaction (%)					
Age	**Gender**	**L1**	**L2**	**L3**	**L4**	**L5**	**Total**
30 – 50	M	0.1	0.1	1.9	1.5	1.1	**4.7**
51 – 60	M	0.4	0.4	2.1	3.3	5.3	**11.5**
61 – 70	M	0.9	1.8	4.3	3.9	4.9	**15.8**
71 - 97	M	0.4	1.5	4.9	6.2	5.1	**18.1**
30 – 50	F	0.1	0.4	1	2	1.7	**5.2**
51 – 60	F	0.8	1	3.9	4	2.8	**12.5**
61 – 70	F	0.7	1.4	4.3	5.2	4.5	**16.1**
71 – 95	F	0.3	1.2	4.4	5.3	4.9	**16.1**
Total		**3.7**	**7.8**	**26.8**	**31.4**	**30.3**	**100**

L - level of interaction, M - male, F - female

Table 2 - Percentage of patients with potential drug interactions by total number o

Total number of medications	Frequency of interaction (%)					
	L1	**L2**	**L3**	**L4**	**L5**	**Total**
2	0	0	0.1	0.1	0.1	**0.3**
3	0.2	0.3	1.2	3.2	1.5	**6.4**
4	0.2	1	1.9	5	6.1	**14.2**
5	1	2.1	5.9	8.4	5.8	**23.2**
6	1.1	2	7.8	6.3	7.1	**24.3**
>7	1.2	2.4	9.9	8.4	9.7	**31.6**
Total	**3.7**	**7.8**	**26.8**	**31.4**	**30.3**	**100**

L - level of interaction

Table 3 - Percentage of patients with potential drug interactions by drug class.

Drug class	N	Frequency of interaction (%)					
		L1	**L2**	**L3**	**L4**	**L5**	**Total**
BB	443	0.9	1.7	8.9	10.1	9.5	**31.1**
ACE-1	434	0.7	1.2	7.2	6.9	7.4	**23.4**
CCB	359	1	2.1	6.3	4.3	4.2	**17.9**
L-D	316	0.6	1.6	2.8	4.3	4.1	**13.4**
T	298	0.3	0.8	1.1	5.2	4.8	**12.2**
α-blockers	59	0.1	0.1	0.2	0.4	0.1	**0.9**
K-D	53	0.1	0.3	0.3	0.2	0.2	**1.1**
AT-RA	0	0	0	0	0	0	**0**
Total	**1962**	**3.7**	**7.8**	**26.8**	**31.4**	**30.3**	**100**

L - level of interaction, BB - beta blockers, ACE-I - angiotensin converting enzym diuretics, T – thiazide, α-B - alpha blockers, K-D - potassium sparing diuretic

regimen for a patient are higher than those with ACE-I or other antihypertensive drug classes.

Discussion. A literature survey using "Drug Interaction" key words in PubMed yielded approximately 10,000 published articles, indicating the importance of this topic in the health practice. However, very few of them discussed the extent of potential drug interactions among patients suffering from cardiovascular diseases and taking antihypertensive agents.[13] The consequences of drug interaction are serious, to the extent that a recent study carried out in the Netherlands claimed that approximately 15% of hospital admissions of elderly patients are caused by adverse effects of drugs.[14] Such adverse effects are mainly due to drug interactions occurring among patients with polypharmacy. Drug interactions sometimes have been present to abolish a drug from the market as has been the case with terfenadine, mibefradil, and cisapride.

Our data reveal that the potential drug interactions occurring with antihypertensive medications are common among patients with cardiovascular diseases. There are several possible reasons for this high percentage of potential drug interactions. One reason is that patients may receive new drugs from the physician without consideration to previous or existing medications. A second possible reason is the existence of patients who attend the governmental centers and also private clinics for other problems, and medications prescribed may not be checked for possible drug interaction with those prescribed at the governmental centers. A third possible explanation is the lack of a clinical pharmacist and shortage of dispensing pharmacist in governmental centers, who should check for possible drug interaction among patient's medications. A fourth explanation is the lack of updated and quick references to drug interactions in the hands of health providers. The findings that the extent of potential drug interaction is high among the sample tested is similar to the findings of a study carried out in the USA.[13] In the USA study, carried out on 524 patients, there was a very high frequency of potential drug interaction. In our tested sample, the frequency of potential interactions significantly increased with increase in age, or with increase in the total number of drugs prescribed, or both. As is known, the prevalence of hypertension increases with advancing age, as does the prevalence of co-morbid conditions and the total number of medications taken. Multi-drug therapy, advancing age and co-morbid conditions are the key risk factors for adverse drug reactions and drug interactions. Gender has no significant effect on the frequency of potential drug interaction established ... must be ... to detect and solve the problem of drug interactions in both the private and governmental pharmacy settings.

needed to appoint skilled pharm[acists] ... Sophisticated drug-interaction so[ftware has] been available for many years. ... would be to train the pharmacist[s] ... drug interactions using av[ailable] ... Unfortunately, published articl[es] ... pharmacists identify many inte[ractions] ... physicians, however, ... many ... computer ... overrides by pharmacist[s] ... published work ... indicated th[at] ... software when used properly ma[y] ... patient health outco[mes].

Our data also indicated that ... more likely to cause drug intera[ctions] ... are mainly due to the fact that these dru[gs are] commonly prescribed for th[e] ... hypertension and have been pres[ent for] 20 years ... agents that a[re] ... CCB, or not comm[only] ... angiotensin II receptor antagon[ists] ... likely to have documented pot[ential] drug interactions.

There are several possible mechan[isms] ... antihypertensive drugs ... inter[act] ... Many antihypert[ensive drugs (]CCB, lip[ophilic BB) are] metabolized by the liver ... enzymes (CYP) via the c[ytochrome] system. Many medications taken ... accelerate the breakdown of antih[ypertensive drugs] ... leading to decrease in their pla[sma levels] ... Conversely, other medications ... oxidase syste[m] ... antihypertensive drug levels, re[sulting] ... hepatic blo[od flow] ... modified by propranolol and ni[...] ... cardiac outpu[t] ... decrease o[f] ... concomit[ant] ... some anti-[...] ... cardiova[scular] ... competing for renal clearance; C[...] ... digoxin, but the m[...] ... muscl[e] ... vasoconstrictio[n] ... alpha 1-b[lockers] ... dihydropyridine can induce ... Nonsteroidal ... (NSAIDs) are able ... antihypertensive effects of B[B] ... ACE inhibitors ... vascul[ar] ... cardiac ... CCB and CCB ... sinoatrial nod[e] ... conduction system and my[ocardium] ... must be avoided ... interactions with BB are relate[d] ... antiarrhythmic drugs and NSAID[s].

It is important to consider here that although drugs investigated pharmacologically belong to antihypertensive drug class, yet these agents might be used for cardiovascular diseases other than hypertension. This report is a valid description of the potential interactions of antihypertensive drug class. Another important argument that must be taken into consideration here is that the significance rating for any specific interaction is determined by the documentation and interpretation of evidence in the literature. This literature is dynamically changing, and hence the significance will also follow.

In conclusion, this study found a high frequency of potential drug interactions (approximately 40%) with medications typically used to treat hypertension. More than 60% of the interactions were not clinically of high significant rating. It is likely that similar frequencies of interactions might be expected in other populations receiving multiple medications. Investigation of drug interactions among other chronic disease groups is important, also providing dispensing pharmacists with drug interaction software alerts is important.

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