

Knowledge about Hypertension and Antihypertensive Medication Compliance in a Jordanian Community Sample

Bodour Al-Jbour Andaleeb Abu Kamel* Hyam Barhoom

Faculty of Nursing, Al-Zaytoonah University of Jordan, PO box 130 Amman (11733) Jordan

* E-mail of the corresponding author: andaleeb@zuj.edu.jo , andaleebabk@ymail.com

Note: this paper was published in proceeding book of the 14th Arab creative student forum in ARABIC language.

Abstract

Hypertension is a common health problem requires patients' compliance to medication. Non-compliance is the failure of patients to follow health instructions. The purpose of this cross sectional study was to investigate what factors influence the elders' knowledge about hypertension and elders' compliance to antihypertensive medications. Elders' knowledge about hypertension and their compliance levels were satisfactory. There was a significant relationship between knowledge and compliance. It was found that elders who reported high scores on hypertension disease knowledge were elders who earned more than 300 JD/month, who remembered name of their medications and who received adequate information about their disease. Knowledge about hypertension and medication were basic prerequisites for elders' compliance to take antihypertensive medications. Nurses and other health care personnel have a key role in improving elders' compliance to their medication through appropriate evidence based interventions.

Keywords: Compliance, Elders, Hypertension, Jordan

1. Introduction

1.1 Literature Review

Since many decades, hypertension was considered a major public health problem in developing countries (Ricardo, Nina, Eija, Jaakko, Aulikki, 2000; WHO, 2011). In Eastern Mediterranean Region, the prevalence of hypertension was 29% and it was affected approximately 125 million individuals (WHO, 2011). Despite hypertension can be controlled through life-style modification, the complications of hypertension were reported as serious health problem leading to stroke, heart failure and kidney problems (Lloyd-Jones, et al., 2010; WHO, 2011). Moreover, the life expectancy for hypertensive patients was shorter than normtensive patients (Lloyd-Jones, et al., 2009).

In Jordan, due to changes in life style, hypertension affected about 26% of adult population (31% in men and 22% in women) (WHO, 2009). According to the Ministry of Health in Jordan (2011), circulatory diseases were the first cause of mortality and were accounted for 36.0% of the total deaths. Furthermore, of circulatory diseases, hypertension was the second leading cause of death after ischemic heart diseases (MOH, 2011). And it was considered a public health problem affected 16.3 of 545 Jordan community-based sample (Jaddou, Bateiha, Ajlouni, 2000). Unexpectedly, in the Jaddou, et al., study, a considerable number of the sample (69%) had aware of having hypertension, but they failed to keep their blood pressure under control.

Cardiovascular diseases included hypertension have health, social and adverse effects not only on the clients, but also on health care systems. In developing countries, the prevalence of hypertension influenced the level of gross national product per capita (Ricardo, et al., 2000). Furthermore, in US, the estimated direct and indirect cost of hypertension management during 2010 was \$76.6 billion (Lloyd-Jones, et al., 2010).

It was found that the blood pressure can be controlled through life style modification and taking antihypertensive medications. However, failure of patients to follow health guidelines and medications led to undesirable health consequences (Lloyd-Jones, et al, 2009). This health-related behaviour is known in health care discipline as non compliance or non adherent. The non compliance behaviour is a persistent concern in nursing practice, and it is one of important nursing problem of the North American Nursing Diagnosis Association (NANDA), and it was defined as "the state in which an individual or group desire to comply but factors are present that deter adherence to health-related advice given by health professional" (Carpenito-Moyet, 2007).

The non compliance (non adherent) is a worldwide health problem in developed and developing countries (WHO, 2003). In United Kingdom, fifty percent of older people do not comply with their medication plan (Griffith, 2010). Non compliance to medication plan particularly in older adult was reported as a complicated phenomenon and was considered as a challenging health issue for patients' families and for the health care personnel (Fulmer, Kim, Montgomery, Lyder, 2001).

The consequences of non compliance not only affect patients and worsen the disease outcomes, but non compliance issue also influencing the entire health care systems (WHO, 2003). The consequences of non compliance could be medication wastage, mismanagement of medical health cases, and increasing hospital readmission rate (Griffith, 2010).

Literature reported many reasons for non compliance behaviour such as patients' social context, emotional difficulties, forgetfulness, side effects of the medication, shortage of drugs, and nature of the disease (Al-Mehza, Al-Muhailije, Khalfan, Al-Yahya, 2009; Dosse, Cesarino, Martin, Castedo, 2009; Russell Daly, Hughes, Op't Hoog, 2003). In other study, elders' beliefs about the incurability of the hypertension and other comorbid health problems were the major causes of non compliance behaviour (Ih Eze, Ojieabu, Femi-Oyewo, Martins, 2011).

In a survey, Nair, Belletti, Doyle, Allen, McQueen, et al. (2011) found that, being too busy, degree of illness, disruption of daily events, and inability to go to pharmacy were of main reasons for non compliance to antihypertensive medications. To fostering compliance, Nair et al., suggested to pattern the patient's compliance behaviour as a daily routine and to establish individualized reminder system.

In a Kuwaiti literature, the non compliance behaviour of hypertensive patients was related to lack of knowledge about hypertension (Al-Mehza, et al., 2009). Al-Mehza, recommended increasing awareness of the patients to the diagnosis and more emphasis on the importance of medication compliance to control the elevated blood pressure (Al-Mehza, et al., 2009).

Nursing literature suggested different approaches to solve the problem of non compliance such as assessing patients' context, and fostering patient-centred approach for transferring power and authority from health care professionals to patients (Russell, et al., 2003). Furthermore, providing care through a multidisciplinary health team was a promising solution for managing non compliance behaviour (Dosse, et al., 2009). Providing counselling about life style modification and antihypertensive medication in addition to medication schedule reminder were effective methods to increase compliance behaviour in tertiary health care setting (Palanisamy & Sumathy, 2009).

There are no known Jordanian studies that have addressed the non compliance problem in elders. Furthermore, Jordan Nursing Council (2008) encouraged researchers to conduct empirical studies on the health needs of vulnerable Jordanian population as a nursing research priority area.

1.2 Purpose of the Study

The primary goal of this study was to investigate the relationship between having knowledge about hypertension and medication compliance in a community based sample of elders. The second goal was to investigate variables influenced elders' knowledge about and compliance to medications. Investigating the non compliance behaviour in elders provide health care decision maker with evidence based data to enable them to provide appropriate interventions such as increasing awareness, education, motivation, and consultation.

2. Methodology

2.1 Design

A cross sectional design with a convenient sample of 273 elder was used. Hypertensive elder patients who attended the Non-Communicable Diseases (NCD) clinics for follow up in two health centres in Amman were recruited in this study. All patients who were above 60 year old, whose diagnosis was hypertension, were mentally competent, and were able to communicate verbally were accessed by researchers and they were informed about the purpose of the study and about data collection strategy. When elders agreed to participate, they signed informed consents. For patients who cannot write; a verbal agreement for participation was obtained in the presence of a witness. Researchers used all measures to protect elders' rights. This study was approved by Scientific and Ethics Committee of the Faculty of Nursing in Al-Zaytoonah University, and the Scientific Research committee of Ministry of Health.

2.2 Data Collection

A structured interview was conducted in privacy with elders to collect data about socio-demographics and health history. Elders' knowledge about hypertension was assessed by Hypertension Knowledge Questionnaire (HKQ). The HKQ was designed by researchers based on related literature. Thirteen questions were found to measure the major domains of elders' knowledge about hypertension such as definition, causes, complications, medications, and life style. The HKQ items were brought three option answers (yes =2, not sure = 1, and no 0), the maximum score of the HKQ was 26 and the minimum was zero. The questionnaire was reviewed by panel of five health experts; two physicians, two nurses and one pharmacist. The items were modified according to their feedback to assure content and face validity of the instrument. Morisky Scale as a widely used instrument (Morisky, Green, Levine, 1986) was administered to elders to measure their medication compliance level. The researchers used the original author's version of the scale. Morisky Scale is a four-item self report instrument of binary responses (no\yes) with 0-4 range of scores.

To assess the feasibility of the study and the suitability of the used measurement tools, a pilot study was conducted with sixteen elders. Test and re-test reliability coefficient was 0.64 for the HKQ and 0.79 for the Morisky instrument. Data was analyzed by SPSS 17. Descriptive statistics, correlation tests in addition to t-test and analysis of variance (ANOVA) were used to analyze the data.

3. Results

The age of the elders ranged from 60-98 years, with mean age of 69 (± 2.3). The majority of the elders were women, married, and elders were living with their spouses and children. More than three-quarters of the elders had less than three hundred JDs income/month, and they spent 1-12 years in schools (Table 1).

Table 1. Socio-Demographics of the Elders

		n	%
Gender	Male	84	30.8
	Female	189	69.2
Marital status	Single, widow\widower, or divorced	78	28.6
	Married	195	71.4
Live with	Spouse and children	140	51.3
	Others than spouse and children	133	48.7
Monthly income	Less than 300 JD/Month	227	83.2
	More than 300JD/Month	46	16.8
Education	Illiterate	68	24.9
	1-12	180	65.9
	More than 12	25	9.2

Elders' mean systolic blood pressure was 155 (± 11.2) mmHg, and the mean for diastolic blood pressure was 90 (± 15.1) mmHg. Elders had history of hypertension less than 5 years. The average number of tablets that dispensed for elders was (3.1 ± 1.6). Thirty-six percent of the elders received three or less tablets of medication in daily basis. Elders could not remember the name of their prescribed medication. The majority of elders received information about their medication, the information was provided mainly by physicians then by nurses. More than half of the elders had other health problems in addition to hypertension. Good health status was reported by elders as their health self evaluation (Table 2).

Table 2 Health Profile and History of Hypertension

		n	%
History of hypertension	Less than 5 years	152	55.7
	More than 5 years	121	44.1
Number of anti-hypertension medication/day	1-3 tablets/day	172	63.0
	4-7 tablets/day	101	37.0
Remember the name of medication	Yes	54	19.8
	No	219	80.2
Receive full information about medication	Yes	196	71.8
	No	77	28.2
Source of disease and medication information	Physicians	189	69.2
	Nurse	39	14.3
	Friends	24	8.8
	Pharmacists	8	2.9
	Other Sources (Mass media and other sources)	13	4.7
Method of remembering taking medication	No help	102	37.3
	Somebody remind him/her to take medication	70	25.6
	Remind with pray time	60	21.9

		n	%
	Put medication beside clock, mirror, or glass case or dine table, etc	41	15.0
Self report health	Excellent-	76	27.8
	Good-	160	58.6
	Poor	36	13.2
Had other diseases	Yes	162	59.3
	No	111	40.7

The elders' mean scores on HKO was 19.1 (± 3.2), and on Morisky scale was 2.8 (± 1.1). The HKQ total scores was significantly positively correlated with medication compliance ($r = 71$, $p = 0.04$). Furthermore, there was an inverse significant correlation between number of tablet/day and Morisky compliance scores (-0.61 , $p = 0.04$). Table 3 reveals that elders who had higher scores on HKQ were people who earned more than 300JDs/month, who remembered their medication by name, and who received adequate information about their medication than others.

Table 3 Means Differences and t-test Results of Elders' Knowledge about Hypertension

		N	Mean(\pm)	t	P
Gender	Male	79	19.3(± 3.2)	0.71	0.4
	Female	164	18.7(± 2.8)		
Marital status	Married	172	19.2(± 3.0)	-2.7	0.06
	Other marital status	71	18.2 (± 3.5)		
Monthly income	Less than 300JD/month	201	18.9 (± 3.1)	-2.2	0.02
	More than 300 JDs/month	42	20.1(± 3.4)		
Living arrangement	With spouse and children	124	19.4(± 3.1)	-1.4	0.15
	With others	119	18.8 (± 3.3)		
Remember name of medication	Yes	50	20.4 (± 3.3)	-3.0	0.00
	No	193	18.8 (± 3.1)		
Number of tablets/day	1-3	153	19.1 (± 3.3)	-0.4	0.68
	4-7	90	19.2 (± 3.0)		
Years of hypertension	Less than 5 years	135	19.0 (± 3.2)	-0.8	0.4
	More than 5 years	108	19.3(± 3.2)		
Received information about medication	Yes	177	19.2 (± 3.2)	3.6	0.00
	No	66	17.9(± 2.8)		
Had other diseases	Yes	142	19.1 (± 3.1)	0.2	0.8
	No	101	19.2 (± 3.4)		

($p = \leq 0.05$)

Table 4 showed that men patients who received adequate information about medication reported significantly higher scores on Morisky tool than women and than those elders who did not receive adequate information about medication.

Table 4 Means Differences and t-test Results of Elders' Compliance to medications

		N	Mean(±)	t	p
Gender	Male	84	3.0 (±1.0)	1.9	0.05
	Female	189	2.7 (±1.1)		
Marital status	Married	195	2.9 (±1.0)	-1.3	0.19
	Other marital status	78	2.7 (±1.1)		
Monthly income	Less than 300JD/month	227	2.8(±1.1)	-0.3	0.76
	More than 300 JDs/month	46	2.9(±0.9)		
Living arrangement	With spouse and children	140	2.8 (±1.1)	-0.1	0.87
	With others	133	2.8 (±1.1)		
Remember name of medication	Yes	53	2.9 (±0.9)	-0.7	0.47
	No	219	2.8 (±1.1)		
Number of tablets/day	1-3	172	2.8 (±1.1)	0.49	0.62
	4-7	101	2.9 (±1.0)		
Years of hypertension	Less than 5 years	152	2.8 (±1.1)	-0.8	0.41
	More than 55 years	120	2.9 (±0.9)		
Received information about medication	Yes	196	2.9 (±1.0)	3.0	0.00
	No	77	2.5 (±1.2)		
Had other diseases	Yes	162	2.8 (±1.0)	0.5	0.60
	No	111	2.9 (±1.1)		

($p = \leq 0.05$)

An analysis of variance (ANOVA) showed that the elders' knowledge of hypertension based on level of self reported health status (excellent, good, and poor) was different significantly ($F=3.57$, $p = 0.04$). The Post hoc analyses revealed that elders with excellent health status had more knowledge about hypertension ($M = 19.8$, ± 3.1) than elders with good ($M=19.0$, ± 3.4) or poor health (18.2 , ± 3.5). Moreover elders compliance was different significantly in elders whose reported health as excellent ($m = 2.9$, ± 0.05) more than good ($M=2.3$, ± 1.2) or poor ($M = 2.0$, ± 1.3). ANOVA test showed no significant differences of elder's knowledge ($F = 0.52$, $p = 0.59$) or compliance ($F= 2.26$, $p= 0.16$) based on source of information (Physician, nurse, pharmacists, others). HKQ scores were significantly higher in elders who were educated more than illiterate or educated less than level 12 years of education ($F= 7.5$, $p = 0.00$). However compliance level was not different significantly across three types of education level ($F = 0.86$, $p = 0.42$). (No table was enclosed)

4. Discussion

This study emphasizes the importance of compliance to antihypertensive medication in the elderly and its relation to their level of knowledge about hypertension. With increasing number of hypertension and other non communicable diseases incidents in Jordan, it is a challenge a task for health care professional to limit the undesirable complication of those problems through enforcing patients' compliance to their medication and other therapeutic plans.

This study highlights the characteristics of Jordanian hypertension patients. The mean age of the elder was in their late sixties, and the majority was women, living in low financial scheme, and they had attended schools for 1-12 years. Some characteristics of the study sample reflect the actual Jordanian elders' social status of that age-related group (Department of statistics, 2007).

Elders in the current study have to take an average of three tablets of medication on daily basis; this number of tablets is considered high, but similar to Vik, et al. (2005) and less than what was documented in other study (Ih Eze, et al., 2011). It was not possible to identify whether these medications prescribed to treat hypertension, or to treat other comorbid health problems. In the current study, 59 % of the elders suffered from other health problem, therefore it is expected that the prescribe medications were not dispensed exclusively to manage hypertension. In the current study the non compliance was related significantly for number of tablet. This result was documented previously (Lin, Huang, Yang, Wu, Chang, et al., 2007; Kairuz, Bye, Birdsall, Deng, Man, et al., 2008), and to overcome this problem Ih Eze, et al. (2011) and Lin, et al., (2007) suggested to minimize the daily doses of

medication and to prescribe long-term tablets to help compliance behavior.

From anecdotal notes, in clinic, nurses' work includes assessing patients' blood pressure, weight, height, vision, and providing health education for the patients. Topics of health education were suggested by patients such as diet, exercise, controlling weight, and other health issues. Nurses were a source for health information in general, but the role of nurses as health educators regarding medication was limited because such information provided exclusively by physicians. However, elders were satisfied by information provided and the majority reported it as adequate.

The elders' scores on knowledge and compliance questionnaires were quite satisfactory; furthermore, the elders' knowledge about hypertension disease and medication was a prerequisite for compliance behavior in the present study. This result was expected and supported other studies (Ih Eze, et al., 2011; Lin et al., 2007; Kairuz, et al., 2008). To further improve patients' compliance, informational, behavioral, and combined strategies were used in relevant literature (Touchette & Shapiro, 2008). To have an effective compliance behavior, an individualized and client-tailored interventions to reduce compliance barriers was recommended (Touchette & Shapiro, 2008)

Patients who earned more than 300 JDs/month, who knew names of their medications, and who had information about their disease showed better knowledge about hypertension and medications. This result could be attributed to better financial status and social context of the elders. Another rational could be the effect of receiving information about the disease and medication. Therefore it is recommended to study the non compliance problem by experimental studies in future.

Elders' knowledge and compliance were higher in patients who reported their health status as excellent. This could be attributed to the integrity of their sensory capabilities and cognitive level than who reported their health as good or poor. Furthermore, elders' who were more educated showed higher knowledge and compliance level. This result was expected since our hypothesis of having better compliance requires good knowledge was supported, and people who have good knowledge are expected to be educated. Elders who received information about hypertension and medication by physician, nurse or by pharmacist were similar in their knowledge level and compliance. This result could be explained by the small number of elders who received information from nurses (14%), or from pharmacist (2.9%), in comparison to those who received information by physicians (69.2%).

5. Conclusion

Because non compliance is a public health problem, in Jordan, multidisciplinary efforts are needed to progress compliance in hypertensive elders. It is recommended to use a surveying tool to assess elders' knowledge and compliance level. Based on the surveyed results; as evidence, health care professional should tailored individualized nursing interventions. Designing health education considering the elders' socio-demographics criteria, health status, past health history should be enforced in clinical areas.

References

- Al-Mehza, A., Al-Muhailije, F. Khalfan, M., Al-Yahya, A. (2009), Drug Compliance among Hypertensive Patients; an Area Based Study, *European Journal of General Medicine*, 6(1), 6-10.
- Carpenito-Moyet, L. (2007), *Understanding the Nursing Process; Concept Mapping and Care Planning for Students*, Philadelphia, Lippincott Williams & Wilkins.
- Department of statistics. (2007), Jordan population and health survey 2007, Retrieved May 3, 2011, from www.dos.gov.jo/dos_home_e/main/.../pop_2012.pdf
- Dosse, C., Cesarino, C., Martin, J., Castedo, M. (2009), Factors associated to patients' noncompliance with hypertension treatment, *Latin American Journal of Nursing*, 17(2):201-6.
- Fulmer, T., Kim, T., Montgomery, Lyder. (2001), What the literature tells us about the complexity of medication compliance in the elderly, *Generations*, XXIV (4), 43-48 .
- Griffith, R. (2010), Managing medication compliance, *British Journal of Healthcare Management*, 16(8), 402-408.
- Ih Eze, U., Ojieabu, W., Femi-Oyewo, M., Martins, O. (2011), Evaluation of Adherence in Elderly Diabetic Hypertensive Patients, *IJPI's Journal of Hospital and Clinical Pharmacy*, 1(4), 38-46.
- Jaddou, H. Y., Bateiha M. I., Ajlouni, K. M. (2000), Prevalence, awareness and management of hypertension in a recently urbanized community, Eastern Jordan, *Journal of Hypertension* , 14, 497-501.
- JNC. (2008). Nursing research priority, Retrieved June 2, 2011, from <http://www.jnc.gov.jo/english/publications/research%20priorities.pdf>
- Kairuz, T., Bye, L., Birdsall, R., Deng, T., Man, L., Ross, A., Samarasinha, I., Tautolo, E. (2008), Identifying Compliance Issues with Prescription Medicines among Older People, *Drugs Aging*, 25 (2), 153-162.
- Lin, Y., Huang, Y., Yang, Y., Wu, J., Chang, C., Lu, F. (2007), Adherence to Antihypertensive Medications among the elderly: A Community-based survey in Tainan city, Southern Taiwan, *Taiwan Geriatr Gerontol*, 2(3),

176-189.

Lloyd-Jones, D., Adams, R., Brown, T., Carnethon, M. Dai, S., De Simone, G., et al. (2010), Heart Disease and Stroke Statistics_2010 Update. A Report from the American Heart Association, *Circulation*, 121:e1-e170. DOI: 10.1161/CIRCULATIONAHA.109.192667

MOH. (2011), Mortality data in Jordan 2008, Retrieved May 24, 2011, from <http://www.moh.gov.jo/MOH/Files/Publication/mortality2008%20.pdf>

Morisky, D. E., Green, L.W., Levine, D. M. (1986), Concurrent and predictive validity of a self-reported measure of medication adherence, *Medical Care*, 24(1), 67-74.

Nair, K., Belletti, D. Doyle, J., Allen, R., McQueen, R., Saseen, J., et al. (2011), Understanding barriers to medication adherence in the hypertensive population by evaluating responses to a telephone survey, *Patient Preference and Adherence*, 5, 195-206. DOI: 10.2147/PPA.S18481.

Palanisamy, S., Sumathy, A. (2009), Intervention to improve patient adherence with antihypertensive medications at a tertiary care teaching hospital, *International Journal of PharmTech Research*, 1(2), 369-374.

Ricardo, F., Nina, I., Eija, L., Jaakko, T., Aulikki, N. (2000), Hypertension in developing economies: a review of population-based studies carried out from 1980 to 1998, *Journal of Hypertension*, 18 (5), 521-529.

Russell, S., Daly, J., Hughes, E., Op't Hoog, C. (2003), Nurses and 'difficult' patients: negotiating non-compliance, *Journal of Advanced Nursing*, 43(3), 281-287.

Touchette, D., Shapiro, N. (2008), Medication compliance, adherence, and persistence: current status of behavioral and educational interventions to improve outcomes, *Journal of Managed Care Pharmacy*, 14(6), 2-10.

Vik, S., Maxwell, C., Hogan, D., S., Patten, S., Johnson, J., Romonko-Slack, L. (2005), Assessing medication adherence among older persons in community settings, *Canadian Journal of Pharmacology*, 12(1), 152-164.

WHO. (2011), Non Communicable Diseases-Hypertension, Retrieved April 20, 2011, from <http://www.emro.who.int/ncd/hypertension.htm>

WHO. (2009), Jordan Health Profile, Retrieved May 15, 2011, from <http://www.who.int/gho/countries/jor.pdf>

WHO. (2003), Adherence to long term therapies, evidence for action, Retrieved May 20, 2011, from http://www.who.int/chp/knowledge/publications/adherence_report/en/

1. Bodour Al-Jbour, RN, BSc

2. Andaleeb Abu Kamel, RN, PhD. Vice Dean-Faculty of Nursing in Al-Zaytoonah University of Jordan. Her specialty is Community Health Nursing and her Major Research Area is Older Adult Health Related Issues.

3. Hyam Barhoom, RN, BSc

Note: this paper was published in proceeding book of the 14th Arab creative student forum in ARABIC language. And we are eager to extend our audience beyond Arab world.

This academic article was published by The International Institute for Science, Technology and Education (IISTE). The IISTE is a pioneer in the Open Access Publishing service based in the U.S. and Europe. The aim of the institute is Accelerating Global Knowledge Sharing.

More information about the publisher can be found in the IISTE's homepage:

<http://www.iiste.org>

CALL FOR JOURNAL PAPERS

The IISTE is currently hosting more than 30 peer-reviewed academic journals and collaborating with academic institutions around the world. There's no deadline for submission. **Prospective authors of IISTE journals can find the submission instruction on the following page:** <http://www.iiste.org/journals/> The IISTE editorial team promises to review and publish all the qualified submissions in a **fast** manner. All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Printed version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

Recent conferences: <http://www.iiste.org/conference/>

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar

