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Visual Display Terminals Health Impact During COVID 19 Pandemic on the Population in Jeddah, Saudi Arabia

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ABSTRACT

Working with visual display terminals (VDT) is growing significantly in the global information age, with the vast growth of digital devices, which is also followed by a higher incidence of health issues. To explore the physical and mental health impacts of long term use of visual display terminals on the population in Jeddah, Saudi Arabia. It was a cross sectional study; the method of non-probability convenient sampling was used to collect data on 503 subjects, in Jeddah city through online-Google forms. Data collection was done through the use of a predesigned questionnaire that provided information on individual, socio-demographic, and clinical features of the subjects as well as information on the aspects of use of VDT. Statistical analysis: data analysis was performed in SPSS version 23. The sample size was 503 subjects with mean age of 31.95 ±12.51 years, 98% of them used VDTs. They used it almost every day (mean= 6.6 ± 1 days), for about 8 hours per day (mean= 8.2± 4.1 hours). Students and office employees used the VDT > 7 hours/day. Almost, all the subjects (99%) used smart phones. Headache, neck pain and shoulder pain, lower back pain, dryness of the eye and interrupted sleep were common complaints among VDT users. It also, interfered with their daily life activities. In principal component factor analysis, duration of use of VDT in hours/day (weight = 0.710), and days/week (weight = 0.724) were significantly loaded on one factor; however, no other variables had weight greater than 0.3 on this factor.

Keywords: VDT, Jeddah, Health effects, COVID-19 pandemic.

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INTRODUCTION

During COVID-19 pandemic, the use of video display terminals (VDT) obviously increased. It had its significant impact on general health as many researches show [1-4]. Females tended more to use smart phones, while males more frequently used laptops, desktops, as well as, handheld, (non-) active game consoles the use of smartphones dominated the rest [1, 5].

The neck/shoulder region initially reported Musculoskeletal symptoms later on also the upper and lower back, arms, wrist and hand [2].

The majority daily VDT use time of most of the partakers 6–11 hours [3, 4, 6, 7]. There is an increase in incidences of dry eye because of the extreme expansion in internet networks and its mediated communications. 36% of respondents to an internet-based self- screening questionnaire reported dry eye symptoms [8]. In the Commonwealth of Massachusetts, the effects of headaches and musculoskeletal discomfort were higher among VDT workers in public utilities, computer and data processing services than in banking, communications, and hospitals. Less frequent symptoms were double vision and coloured halos around objects, with prevalence below [9]. There is a range of 12.1% to 71.5% in the year-long prevalence of neck pain in grown-ups. The increased Frequency of neck disorder, upper and lower back extremity has been linked to the heightened us of VDT [10-12]. Lower back pain being the chief hinderance in VDT workers. The significant increase in proportion of

partakers testifying about physical discomfort from backache to ocular soreness can be attributed to the higher number of VDT work hours [13-15]. An age and gender adjustment in the multivariate models showed a prevalence of wrist/hand symptoms with prolonged screen time [16]. A primarily localization of the dermatological conditions show that repetitive friction and trauma causes the majority of palm and finger problems as well as allergic contact sensitivities [17]. The worsening of depressive and anxiety states form the main mental health effects. Collectively referring to the symptoms as VDT syndrome. A sharp increase in the syndrome is attributed to longer VDT work hours i.e., exceeding five hours [18]. Prolonged use of VDT was associated, also, with insomnia, irritability, weariness, sleep disturbances and psycho-physical troubles [19, 20].

A study in Japan confirmed that an excess of 5hours in VDT attributed to a degradation in mental health in its administrative staff [21]. Additionally, poor self-rated health was linked to a 3 hour plus use of VDT according to a national study of Saudi adults [22]. An exploration of the magnitude and frequency of VDT use during the COVID-19 pandemic, and occurrence of self-reported health complaints among the population of Jeddah, Saudi Arabia was the main aim of the study.

MATERIALS AND METHODS

The method of non-probability convenient sampling was used to collect data for the cross sectional study, on the population through web based online-Google forms. The minimal sample size required for the present study was calculated to be 220 subjects, using G*Power software, according to alpha = 0.05, and Power= 95%, and 5 degrees of freedom [23]. The total number of subjects enrolled in the present study was 503 respondents. collection of data was done by a predesigned questionnaire which provided information on individual, sociodemographic, and clinical features of the subjects; in addition to information on the duration and frequency of use of VDT, as well as the purpose and way of using it. Approval of the design of the study was granted by the Institutional Review Board of the Ibnsina National College for medical studies (No. H-11-09062021).

Statistical analysis: SPSS version 22 was used. Chi square test of significance and principal component factor analysis were used and weights for loading on the variables were calculated. Loadings equal or greater than 0.5 were considered significantly associated with the extracted factor. All variables that significantly loaded on a factor are significantly associated with each other. Level of significance for the present study was 0.05.

RESULTS AND DISCUSSION

The total number for the present study was 503; with a mean of 31.95 years (SD: 12.51). Quite a number of subjects (97.6%) used video display terminals (VDT). The mean use per days of the week was 6.6 days (SD: 1), and the mean hour use of VDT per day was 8.2 (SD: 4.1).

Table 1 shows the distribution of the studied subjects by duration of use of VDT and personal characteristics and self-reported morbidity conditions. Majority of the subjects who used VDT were females (82.3%), and bachelor holders (69.2%); however, they were no significantly related to number per hour use per day ($p>0.05$). Students and those who have office jobs used the VDT more than 7 hours per day (38.4%, and 30.3% respectively) more than less than 7 hours per day (24.3%, and 25.2%), this difference was statistically significant ($p < 0.000$). Smoking was irrelevant to use of VDT ($p <0.502$). Diabetes mellitus was significantly more encountered among those who used VDT less than 7 hours per day compared to those who used VDT over 7 hours per day (11.2%, and 5.7% respectively), where $p < 0.027$. Joint diseases showed similar trend ($p < 0.002$). Hypertension, heart disease, visual disturbance and allergies were irrelevant to duration of use of VDT per day ($p >0.05$). **Table 2** displays the distribution of studied subjects by duration of use of VDT per day and characteristics of use of VDT device. Majority of the subjects used smart phones (98.6%), laptops (69.1%), and tablet devices (50.5%).1%); lease percentage used desktop computers (32.1%). The duration of use per day was irrelevant to the VDT device used ($p > 0.05$). The purpose of use of the device was for study, entertainment and/or work; it was irrelevant to the duration of use per day ($p <0.136$). Majority of the subjects used the VDT 7 days per week (83.7%); however in was

higher among those who used VDT over 7 hours per day (89.2%) compared to those who used the VDT less than 7 hours per day (75.7%), where p <0.002. Majority of the subjects spend time using VDT while sitting on couches (45.8%); those who use VDT over 7 hours per day tended to use desks and bed while using the devices (20.9%, and 38.7% respectively), more commonly compared to those who used DVT devices for less than 7 hours per day (15.6%, and 30.7% respectively), this difference were statistically significant (p <0.013). **Table 3** reveals hours of use of VDT per day and self-reported complaints. Headache (76.5%) was the most prevalent complaint among VDT users, followed by neck pain and shoulder pain and lower back pain (59.2%, 55.9%, and 45.7% respectively). Dryness of the eye was next in frequency (52.9%). Double vision and numbness of the fingers were reported by over one third of the VDT users (32.8%, and 37.3% respectively). All these complaints were irrelevant of duration of use of VDTs per day (p > 0.05). **Table 4** depicts the association between hours of use of VDTs per day and life style changes. Mood swings (60.0%), and interrupted sleep (56.5%) were main complaints reported by the VDT users, however they were irrelevant to duration of exposure to VDT per day (p > 0.05). Large proportion of the VDT users (44.5%) reported that using VDTs interfered with their daily life activities; and had difficulty falling asleep (44.1%); these complaints were irrelevant to the duration of use VDT per day (p > 0.05). A sizable proportion of the subjects (43.1%) reported that they got depressed, if the VDT hadn't been available; this was significantly more common among those who use the VDT > 7 hours per day (48.5%) compared to those who use VDT < 7 hours per day (35.4%), where p < 0.004. **Table 5** shows the principal component factor analysis for the VDT use characteristics and other personal and clinical variables. The variables use of DVT in hours per day (weight= 0.710), and use of VDT in days per week (weight=0.724) were significantly associated with factor 8; no other variable had weight greater than 0.5 on this factor.

It has long been established that poor self-rated health and severe psychological distress was linked to a 10 hour plus use of VDT for work [21, 22, 24]. Additionally, a 4–9 h usage of VDT especially during the Covid-19 pandemic, was linked to extreme psychological distress among young staff. However as for non-work activities, VDT did not have the extreme effects in both physical and mental health [25]. This study was done to explore the link between self-reported psychological and health distress and VDT usage among the general population, in Saudi Arabia during the COVID-19 pandemic. Smartphone use dominated with a higher usage in girls than boys, whilst in boys there was a much higher use of laptops, desktops, in addition to, handheld, (non) active game consoles. Laptop use increase with increasing school level [1]. Similar findings were found in the present study. Smartphone use dominated multiple activities: homework, videos, games and general use among the devices [26]. Social activity, like messaging and social media, was used the most in the smartphone, whilst tablet use was mainly watching videos, desktop and laptop [6]. In the present study, the purpose of use of the VDT was for study, entertainment and/or work; it was irrelevant to the duration of use per day (p <0.136). Headache (76.5%) was the most prevalent complaint among VDT users, followed by neck pain and shoulder pain and lower back pain (59.2%, 55.9%, and 45.7% respectively). This is similar to previous studies [4, 18, 20] which stated that an increased prevalence of neck disorders, upper and lower back of the body was attributed to a higher use of Visual Display Terminal (VDT). There is an increase in incidences of dry eye because of the extreme expansion in internet networks and its mediated communications. 36% of respondents to a web-based self-screening questionnaire reported dry eye symptoms [8]. This is in line with the present study which found that over 50% of the VDT users suffered from dry eye disease.

Table 1. Distribution of studied subjects by duration of use of VDT and personal characteristics and morbidity history.

Variable	Categories	Time of use of VDT per day				Total		X^2 (p- value)
		< 7 hours		≥ 7 hours		N	%	
		N	%	N	%			
Gender	Female	176	85.9%	237	97,8%	413	82,3%	3.049

	Male	29	14,1%	60	20,2%	89	17,7%	(0.081)
Education	bachelor or higher	141	68.4%	207	69.7%	348	69.2%	0.089
	less than bachelor	65	31.6%	90	30.3%	155	30.8%	(0.765)
Job	No job	86	41.7%	75	25.3%	161	32.0%	20.091 (0.000)
	Student	50	24.3%	114	38.4%	164	32.6%	
	Hand worker	18	8.7%	18	6.1%	36	7.2%	
	Office job	52	25.2%	90	30.3%	142	28.2%	
Smoking	Non smoker	182	88.3%	256	86.2%	438	87.1%	0.502
	Smoker	24	11.7%	41	13.8%	65	12.9%	(0.479)
Diabetes	No	183	88.8%	280	94.3%	463	92.0%	4.920
	Yes	23	11.2%	17	5.7%	40	8.0%	(0.027)
hypertension	No	188	91.3%	274	92.3%	462	91.8%	0.160
	Yes	18	8.7%	23	7.7%	41	8.2%	(0.689)
Heart disease	No	202	98.1%	290	97.6%	492	97.8%	0.098
	Yes	4	1.9%	7	2.4%	11	2.2%	(0.754)
Joint disease	No	178	86.4%	280	94.3%	458	91.1%	9.224
	Yes	28	13.6%	17	5.7%	45	8.9%	(0.002)
Visual impairment	No	122	59.8%	170	58.0%	292	58.8%	0.158
	Yes	82	40.2%	123	42.0%	205	41.2%	(0.691)
Allergies	No	115	55.8%	173	58.6%	288	57.5%	5.031 (0.282)
	Chest	20	9.7%	21	7.1%	41	8.2%	
	Rhinitis	35	17.0%	21	7.1%	100	20.0%	
	Eye	8	3.9%	8	2.7%	16	3.2%	
	Skin	28	13.6%	28	9.5%	56	11.2%	

Table 2. Distribution of studied subjects by duration of use of VDT and characteristics of use of VDT device.

Variable	Categories	Time of use of VDT per day				Total		X^2 (p- value)
		< 7 hours		≥ 7 hours				
		N	%	N	%	N	%	
use a smart phone	No	1	0.5%	6	2.0%	7	1.4%	2.088
	Yes	205	99.5%	291	98.0%	496	98.6%	(0.148)
use a tablet device	No	103	50.0%	146	49.2%	249	249.5%	0.034
	Yes	103	50.0%	151	50.8%	254	50.5%	(0.854)
Use a laptop	No	66	32.0%	89	30.1%	155	30.9%	0.221
	Yes	140	68.0%	207	69.9%	347	69.1%	(0.638)
Use a desktop computer	No	145	70.4%	196	66.2%	341	67.9%	0.971
	Yes	61	29.6%	100	33.8%	161	32.1%	(0.325)
Purpose of use*	S	11	5.3%	9	3.0%	20	4.0%	9.744 (0.136)
	W	39	18.9%	41	13.8%	80	15.9%	
	E	41	19.9%	48	16.2%	89	17.7%	
	S,W	7	3.4%	14	4.7%	21	4.2%	
	W,E	22	10.7%	40	13.5%	62	12.3%	
	S,E	51	24.8%	70	23.6%	121	24.1%	
	S,W,E	35	17.0%	75	25.3%	110	21.9%	
Number of days per week using devices	1	3	1.5%	1	0.3%	4	0.8%	20.762 (0.002)
	2	2	1.0%	2	0.7%	4	0.8%	
	3	5	2.4%	2	0.7%	7	1.4%	
	4	1	0.5%	1	0.3%	2	0.4%	

	5	31	15.0%	15	5.1%	46	9.1%
	6	8	3.9%	11	3.7%	19	3.8%
	7	156	75.7%	265	89.2%	421	83.7%
Way of spending time on VDT	On desk	32	15.6%	62	20.9%	94	18.7%
	On couch	110	53.7%	120	40.4%	230	45.8%
	On bed	63	30.7%	115	38.7%	178	35.5%

8.630 (0.013)

*S:study ; W:worke ; E:entertainment.

Table 3. Distribution of studied subjects by duration of use of VDT and occurrence of health problems.

Variable	categories	Time of use of VDT per day				Total		X^2 (p- value)
		< 7 hours		≥ 7 hours		N	%	
		N	%	N	%			
Eye dryness	No	97	47.1%	140	47.1%	237	47.1%	0.00 (0.991)
	Yes	109	52.9%	157	52.9%	266	52.9%	
Headache	No	52	25.2%	66	22.2%	118	23.5%	0.618 (0.432)
	Yes	154	74.8%	231	77.8%	385	76.5%	
Double vision	No	139	67.5%	199	67.0%	338	67.2%	0.012 (0.912)
	Yes	67	32.5%	98	33.0%	165	32.8%	
Neck pain	No	84	40.8%	121	40.7%	205	40.8%	0.00 (0.994)
	Yes	122	59.2%	176	59.3%	298	59.2%	
Shoulder pain	No	92	44.7%	130	43.8%	222	44.1%	0.039 (0.843)
	Yes	114	55.3%	167	56.2%	281	55.9%	
Lower or upper back pain	Upper	49	23.8%	57	19.2%	106	21.1%	3.613 (0.164)
	Lower	84	40.8%	146	49.2%	230	45.7%	
	No	73	35.4%	94	31.6%	167	33.2%	
Wrist pain	No	149	72.3%	226	76.1%	375	74.6%	0.908 (0.341)
	Yes	57	27.7%	71	23.9%	128	25.4%	
Hands joint pain	No	142	68.9%	228	76.8%	370	73.6%	3.840 (0.050)
	Yes	64	31.1%	69	23.2%	133	26.4%	
Hands muscle weakness	No	163	79.1%	244	82.2%	407	80.9%	0.722 (0.395)
	Yes	43	20.9%	53	17.8%	96	19.1%	
Fingertips numbness	No	124	60.2%	190	64.0%	314	62.4%	2.073 (0.355)
	Yes	81	39.3%	107	36.0%	188	37.4%	
Hands shivering	No	172	83.5%	239	80.5%	411	81.7%	0.744 (0.388)
	Yes	34	16.5%	58	19.5%	92	18.3%	
Dry hands	No	163	79.1%	233	78.5%	396	78.7%	0.033 (0.856)
	Yes	43	20.9%	64	21.5%	107	21.3%	
Itchiness hands	No	165	80.1%	258	86.9%	423	84.1%	4.170 (0.041)
	Yes	41	19.9%	39	13.1%	80	15.9%	
Recurrent skin inflammation	No	177	85.9%	262	88.2%	439	87.3%	0.576 (0.448)
	Yes	29	14.1%	35	11.8%	64	12.7%	

Table 4. Distribution of studied subjects by duration of use of VDT and life style and psychological state.

Variable	categories	Time of use of VDT per day				Total		X^2 (p- value)
		< 7 hours		≥ 7 hours		N	%	
		N	%	N	%			
Interference with daily life activity	No	115	55.8%	164	55.2%	279	55.5%	0.018 (0.893)
	Yes	91	44.2%	133	44.8%	224	44.5%	

Depressed if VDT is not available	No	133	64.6%	153	51.5%	286	56.9%	8.442 (0.004)
	Yes	73	35.4%	144	48.5%	217	43.1%	
Mood swings	No	87	42.2%	114	38.4%	201	40.0%	0.751 (0.386)
	Yes	119	57.8%	183	61.6%	302	60.0%	
Difficulty falling asleep	No	115	55.8%	166	55.9%	281	55.9%	0.00 (0.988)
	Yes	91	44.2%	131	44.1%	222	44.1%	
Interrupted sleep	No	90	43.7%	129	43.4%	219	43.5%	0.003 (0.955)
	Yes	116	56.3%	168	56.6%	284	56.5%	

Table 5. Principal component factor analysis with Vari Max rotation of the use of VDT and personal, social, morbidity history

Rotated Component Matrix

Variables	Component							
	1	2	3	4	5	6	7	8
Sex	-.041	.087	-.817	.006	.043	.065	.043	-.070
Age	.634	-.062	.285	-.160	-.139	.128	-.139	-.293
Smoking	-.088	.094	.776	-.080	.155	-.006	-.003	.047
Diabetes Mellitus	.477	-.113	.387	.054	-.298	.152	.224	-.062
Hypertension	.373	.025	.323	.145	-.425	.296	.027	-.146
Use of VDT hours/day	-.047	.039	.051	.113	.075	-.108	.196	.710
Use of VDT days/weeks	.032	-.053	.047	.049	-.121	.095	-.225	.724
Eye dryness	.302	.178	-.099	.142	.271	.196	.071	.059
Headache	-.207	.501	-.234	.083	.149	.202	.118	.114
Double vision	.170	.235	-.043	.107	.260	.135	.398	-.061
Neck pain	.137	.721	.085	.137	.063	.196	.094	.004
Shoulder pain	.240	.748	.011	.059	.067	.042	.037	-.058
Lower/ upper back pain	-.115	-.688	-.001	-.025	-.055	.124	-.062	.010
Wrist pain	.702	.228	-.107	.015	.115	.014	-.070	.039
Hands joint pain	.699	.172	-.047	.045	.113	.048	.089	.048
weakness in hand muscles	.585	.165	.010	-.138	.196	.200	.305	.104
Numbness in fingertips	.424	-.043	-.002	.315	.068	-.059	.328	-.136
Tremors	-.040	.179	.042	.112	-.130	.027	.756	.001
Dry rough hands	.236	-.044	-.102	-.109	.291	.243	.515	.071
Hand itchiness	.186	.042	.050	.113	.073	.748	.111	-.071
recurrent skin inflammations	.037	.094	-.078	-.035	.056	.799	.060	.041
VDT interferes with daily life activities	.077	.113	-.145	.573	.187	-.043	-.095	.031
Depressed/ anxious if VDT are not available	.026	.006	.049	.741	.048	.024	.069	.194
Mood swings	-.142	.170	.003	.656	.197	.148	.170	-.033
Difficulty falling asleep	.084	.092	.035	.275	.663	.047	.071	-.035
Interrupted sleep	.149	.148	.133	.230	.675	.127	.027	-.054

Double vision and numbness of the fingers were reported by over one third of the VDT users (32.8%, and 37.3% respectively). This is consistent with findings from previous study [10, 17]. The worsening of anxiety and depressive states have been reported as mental health effects. Prolonged VDT work is associated with insomnia, irritability, weariness, psycho-physical troubles [18-20]. In the present study mood swings (60.0%), and interrupted sleep (56.5%) were main complaints reported by the VDT users. Large proportion of the VDT users (44.5%) reported that using VDTs interfered with their daily life activities; and had difficulty falling asleep (44.1%). In the recent years there has been a rapid increase in smartphone use. This may result in the convergence of internet addiction and mobile phone problems into smartphone addiction [26]. In the present study a 43.1% reported that they got depressed, if the VDT hadn't been available; this was significantly more common among those who use the VDT > 7 hours per day. Principal component factor analysis revealed that all physical and psychological manifestations were irrelevant of the duration of usage of VDT regarding hours per day or days per week.

Limitations

Some limitations to this study are: firstly, there is a subjective measurement of the use of VDT that might not represent the existent use. However, a closed estimate of actual use was employed by asking the partakers the total hours of VDT usage per day. Secondly, due to the cross-sectional nature of the study, it is not possible to deduce if the effects of the use of VDT in the COVID-19 pandemic will have a persevere in the long run. In order to look into the long-term health effects of non-pharmacological measures during the COVID-19 pandemic, further studies are required.

CONCLUSION

Almost, all the subjects (99%) used smartphones. Headache, neck pain and shoulder pain and lower back pain, and dryness of the eye, mood swings and interrupted sleep were common complaints among VDT users. It also, interfered with their daily life activities. In principal component factor analysis use of DVT in hours per day (weight= 0.710), and days per week (weight=0.724) were significantly loaded on one factor; however, no other variables had weight greater than 0.5 on this factor. Prolonged use of VDT may lead to VDT addiction. A recommendation of more study on the links between health and purpose- specific VDT usage.

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CONFLICT OF INTEREST: None

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ETHICS STATEMENT: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Ibnsina National College for medical studies (No. H-11-09062021, approval date: 9 – 6- 2021).

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