

"Effectiveness Of Video-Based Teaching Program And A Log Sheet To Prevent Pressure Ulcers In India - An RCT"

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Abstract-

Background: Pressure ulcers, also known as bedsores, are a significant healthcare concern globally. According to a systematic review, it has been estimated that the incidence of Pressure ulcers is around 12% in USA (1) and it is one of the most ignored issues in healthcare sector. However, there is a lack of conclusive data available to ascertain the incidence of pressure ulcers specifically in India.

Objectives: This study aimed at developing an effective video-based learning resource material for caregivers of patients with severe neurological disabilities in order to reduce the incidence and severity of PUs in the patients.

Methods: A Cluster-RCT was conducted with 94 pairs of participants in Neurology and Neurosurgery wards of a tertiary care hospital, North India. The self-developed video-based teaching program and log-sheet was given to the experimental (n=45) group in addition to routine care whereas the control group (n=49) received only routine care for 8 weeks respectively. Efficacy of the intervention was evaluated at two times in different time periods. The PUSH tool, Modified Rankin Score and Braden score were used to assess incidence and severity, disability of patients and risk assessment of PUs respectively. The data was analysed using the descriptive and inferential statistics.

Results: The baseline knowledge was reflective of the deficiencies existing in the care of PUs among caregivers in both groups. The incidence and severity of PUs was significantly higher in control group at post-test I & post-test II ($p=0.001$). There was a significant increase of knowledge in the Experimental group immediately after intervention as well as 8 weeks later.

Conclusion: The video-based teaching program was highly effective in reducing the incidence & severity of PUs and gain in knowledge of pressure ulcers among caregivers of experimental group.

Keywords- Pressure ulcers, Pressure injury, video-based teaching, incidence, severity, wounds, nursing care, bedsores

Date of Submission: 09-10-2023

Date of Acceptance: 19-10-2023

I. INTRODUCTION –

"A pressure injury/pressure ulcer is localized damage to the skin and/or underlying soft tissue, usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities, and condition of the soft tissue"(2). The prevalence of PUs is 12.8% worldwide but there is no definite data to represent each country. Pressure ulcers (PUs) are considered as one of the most common complications developed in prolonged bedridden patients. Pressure ulcers are a serious health issue for patients in all kinds of settings. More than 80% of the bedridden patients ever develop Pressure ulcers (3). Although routine care is provided in hospitals, the incidence of pressure ulcers (PUs) varies significantly across different care settings. In major hospitals, the incidence ranges from 0.4% to 38.0%, while

in long-term care settings, it is between 2.2% and 23.9%. Home care settings show a range of 0% to 17% (4). In a study conducted by Singh et al. in 2005, neurological disorders were identified as the leading contributor to overall morbidity. Among patients with neurologic impairments, the incidence of pressure ulcers is 78% annually, with a lifetime risk estimated to be between 25% and 85%. Additionally, pressure ulcers are listed as the direct cause of death in 7-8% of individuals with paraplegia, who also experience the highest recurrence rate of 80% (5).

The Indian healthcare system faces challenges in providing optimal care to patients, particularly those with severe neurological conditions, due to staff shortages. To address this issue, it is necessary to educate and enhance the skills of caregivers rather than relying solely on nurses. The objective of the study is to reduce the occurrence of pressure ulcers and alleviate the workload on nurses by implementing its findings in clinical practice.

AIMS-

This study aimed at developing an effective video-based learning resource material for caregivers of patients with severe neurological disabilities to reduce the incidence and severity of PUs in the patients.

II. METHODS-

Study design and participant recruitment

The study obtained ethical clearance from the Institutional Ethical Committee (Ref No: IECPG-248/24.03.2021 RT-35/28.4.21) and was registered under trial number CTRI/2021/07/034794. It was designed as a cluster randomized control trial (RCT). The allocation of wards to the experimental and control groups was determined using a simple lottery method, while participant recruitment followed a consecutive sampling approach. Initially, a total of 110 pairs of participants, consisting of patients and their caregivers who met the inclusion criteria, were recruited. However, throughout the study, 9 participants from the control group and 7 participants from the experimental group had to be withdrawn due to reasons such as loss to follow-up and death.

The inclusion criteria for the study were as follows: caregivers of adult patients with severe neurological disability, regardless of the underlying cause, with a Modified Rankin Score (mRS) of ≥ 4 ; caregivers above the age of 18; and caregivers of patients with a PUSH tool score of 0. On the other hand, the exclusion criteria were: patients with uncontrolled co-morbidities; caregivers of patients with a PUSH tool score of ≥ 1 ; and patients whose condition improved to mRS ≤ 3 in the period of follow-up were excluded from the study.

Randomization

The researcher screened all eligible participants and obtained written informed consent. Subsequently, the researcher randomly allocated the participants into either the control or experimental group using a simple lottery method. It was not possible to blind the participants or the intervention implementers due to the nature of the intervention.

Experiment procedure

Data were collected from August to December 2021. Informed written consent was taken from the caregivers. Demographic data and clinical profile of patients and their caregivers were collected with the help of a demographic data form. Subsequently, the pre-test baseline knowledge and risk assessment of pressure ulcers are assessed by using the knowledge questionnaire and Braden scale respectively, in both the control and experimental group.

Intervention

The intervention involved providing video-assisted teaching and a self-developed log-sheet to caregivers of patients with severe neurological disability for recording practices in the home/hospital setting over a period of 60 days. The teaching video was divided into two sections. On the first day, the experimental group received a face-to-face teaching session using the first section of the video, which provided an overview of pressure ulcers. On the third day, they received the second teaching session using the second section of the video, which focused on caring for patients and preventing pressure ulcers. On the fourth day, caregivers demonstrated the care steps taught by the researchers to ensure competency.

In contrast, the control group received only routine care, as per the standard practices followed in the hospital/home setting. The post-test was conducted at two intervals. The first post-test (I) took place immediately one day after the intervention, followed by providing the self-developed log-sheet to caregivers to maintain a record of activities for the next eight weeks. The researcher assessed pressure ulcers once a week using the PUSH Tool. When patients were present in the hospital, the assessment was conducted physically by

the researcher, but for discharged patients, it was done online. The second post-test (II) was conducted after eight weeks following the intervention.

statistical analysis

SPSS 22.0 was used for analysis. Data were analysed using descriptive and inferential statistics. Descriptive statistics such as frequencies, percentages, and measures of central tendency were calculated. Demographic characteristic and baseline data were analysed between groups for homogeneity. The homogeneity was analysed with independent *t*-test and chi-square dependent on the nature. The effectiveness of the intervention of the study was analysed using paired *t*-test and McNemar test with the mean and 95% Confidence Interval (CI). A *p*-value of 0.05 or lower was considered statistically significant.

III. RESULTS –

At the end of the study, only 94 participants (control *n*= 45pairs; experimental *n*= 49pairs) remained for final analysis (Fig.1)

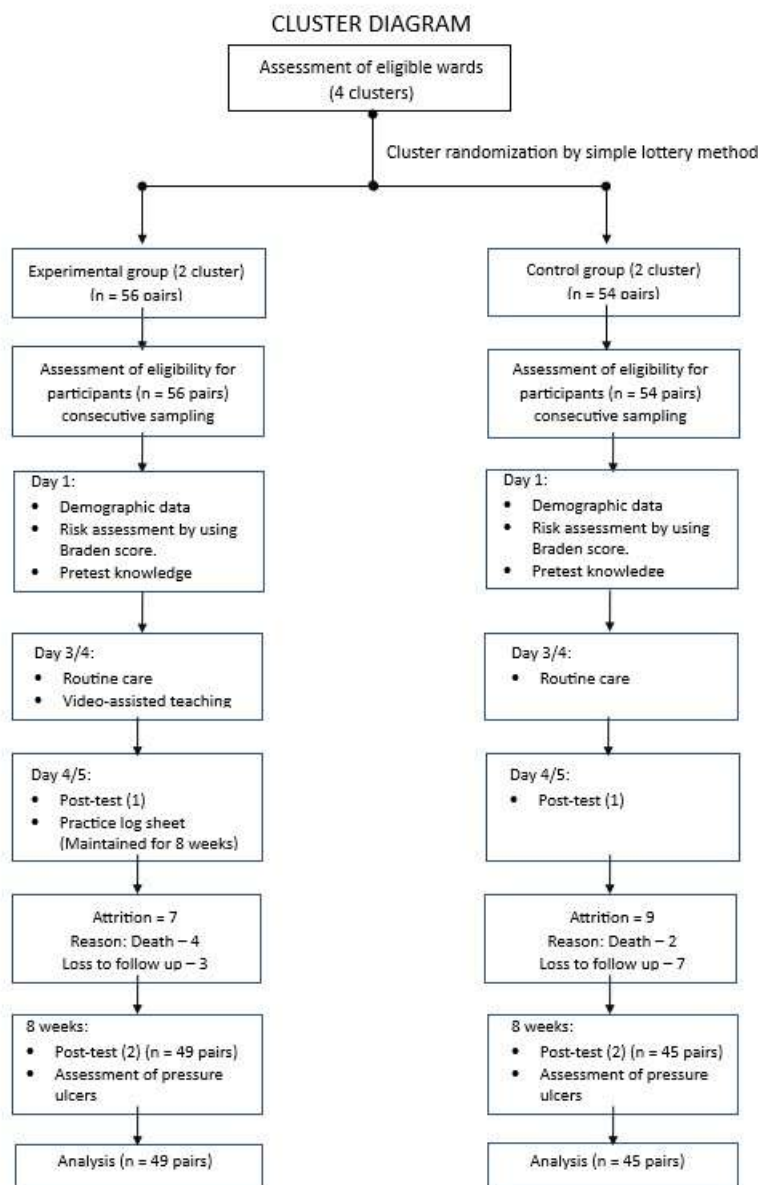


Figure 1: The CONSORT – Cluster trial flowchart to show the methodology for data collection.

In comparison of demographic variables of caregivers in control and experimental group, the two groups were found to be comparable in terms of most of the variables except family size ($p=0.023$), marital status ($p=0.036$) and in socioeconomic status ($p=0.028$) (Table1). In the control group, the majority of patients were in the mild category of Braden score for risk assessment (60%) whereas in experimental group, it was in moderate category (57.14%) and high risk (8.16%). The mRS score in the control group was 4.46 ± 0.50 and in the intervention group 4.71 ± 0.45 (Table2)

Table1

Homogeneity analysis on caregivers' demographic profile in both groups

| Variables | Control group(n= 45) Frequencies (%) | Experimental group(n=49) Frequencies (%) | p value |
|--|--|---|---------------|
| Age (mean \pm SD) | 38.13 \pm 10.95 | 40.36 \pm 12.30 | 0.356 |
| Gender | | | |
| • Male | 21 (46.67%) | 19 (38.78%) | 0.532 |
| • Female | 24 (53.33%) | 30 (61.22%) | |
| Family type | | | |
| • Nuclear | 10 (22.22%) | 18 (36.73%) | 0.124 |
| • Extended | 35 (77.78%) | 31 (63.27%) | |
| Family Size (mean \pm SD) | 7.82 \pm 2.48 | 6.55 \pm 2.82 | 0.023* |
| Relationship with patient Family member | | | |
| 1. Parents | 10 (20.22%) | 13 (26.53%) | 0.583 |
| | 15 (33.33%) | 18 (36.73%) | |
| 2. Spouse | 8 (17.78) | 7 (14.29%) | |
| 3. Siblings/son/daughter | 10 (22.22%) | 6 (2.24%) | |
| 4. Daughter/son In-laws | 2 (4.44) | 5 (10.20%) | |
| 5. Relatives and others | | | |
| Duration of care (hours/day) | | | |
| • 6-12 | 1 (2.22%) | 2 (4.07%) | 0.796 |
| • 13-18 | 15 (33.33%) | 14 (28.57%) | |
| • 19-24 | 29 (64.44%) | 33 (67.35%) | |
| Marital status | | | |
| • Married | 43 (60%) | 40 (81.63%) | 0.036* |
| • Unmarried | 2 (4.44%) | 9 (18.37%) | |
| Place of Residence | | | |
| • Urban | 12 (26.67%) | 7 (14.29 %) | 0.179 |
| • Rural | 33 (73.33%) | 42 (85.71%) | |
| Socio-economic status | | | |
| • Upper (I) | - | - | 0.028* |
| • Upper middle (II) | 1 (2.22%) | 1 (1.06%) | |
| • Lower middle (III) | 6 (13.33%) | 10 (10.64%) | |
| • Upper Lower (IV) | 31 (68.89 %) | 20 (48.98%) | |
| • Lower (V) | 7 (15.56%) | 18 (42.86%) | |

Table 2

Homogeneity analysis on clinical profile for patients in both groups

| Variables | Control group (n= 45) f (%) | Experimental group (n= 49) f (%) | p-value |
|---|--------------------------------|-------------------------------------|---------------|
| Age (mean ± SD) | 44.93 ± 17.81 | 45 ± 16.53 | 0.985 |
| Gender | | | |
| • Male | 28 (62.22%) | 18 (36.73%) | 0.917 |
| • Female | 17 (37.78%) | 31 (63.27%) | |
| Weight in kg (mean ± SD) | 55.71 ± 6.82 | 55.61 ± 6.39 | 0.942 |
| Height in cms (mean ± SD) | 161.11 ± 5.54 | 162.81 ± 5.34 | 0.132 |
| Pressure ulcers grade | | | |
| • No pressure ulcers | 23 (51.11%) | 34 (69.39%) | 0.186 |
| • Grade 1 | 22 (48.89%) | 15 (30.61%) | |
| Braden score (Risk assessment) | | | |
| • Mild (16-18) | 27 (60%) | 17 (34.69%) | 0.016* |
| • Moderate (13-15) | 18 (40%) | 28 (57.14%) | |
| • High risk (9-12) | - | 4 (8.16%) | |
| Length of stay in hospital (days) (mean ±SD) | 90.54 ± 11.24 | 95.68 ± 10.65 | 0.137 |
| Feeding | | | |
| • Oral intake | 9 (20%) | 10 (20.41%) | 0.961 |
| • Ng feed | 36 (80%) | 39 (79.59%) | |
| PU developed in - | | | |
| • Home | 8 (17.78%) | 6 (12.24%) | 0.189 |
| • Hospital | 14 (31.11%) | 9 (18.37%) | |
| GCS (mean + SD) | 9.22 + 1.64 | 9.73 ± 1.65 | 0.342 |
| mRS (mean + SD) | 4.46 ± 0.50 | 4.71 ± 0.45 | 0.014* |

On comparing incidence of pressure ulcers immediately after intervention, the majority of patients in control group were found to have developed pressure ulcers (55.56%) as compared to 32.65% in experimental group. There was a statistically significant decrease in incidence of pressure ulcers after 8 weeks of intervention in the experimental group when assessed by direct observation at (p=0.001) but there were no significant changes in the control group (Table 3).

Table 3

Comparison of effectiveness of intervention on incidence of pressure ulcers in control and experimental group

| Variables | Control group (n= 45) Frequencies (%) | Experimental group (n= 49) Frequencies (%) | χ ² value | p-value |
|-----------|---|--|----------------------|---------|
| | | | | |

| | | | | |
|--|-------------|-------------|-------|---------------|
| During allotment – | | | | |
| • No pressure | 23 (51.11%) | 34 (69.39%) | 3.282 | 0.070 |
| • Pressure ulcers | 22 (48.89%) | 15 (30.61%) | | |
| Immediately after intervention | | | | |
| • No pressure ulcers | 20 (44.44%) | 33 (67.35%) | 5.003 | 0.025* |
| • Pressure ulcers | 25 (55.56%) | 16 (32.65%) | | |
| After 8th week of intervention | | | | |
| • No pressure ulcers | 22 (48.89%) | 44 (89.80%) | 18.76 | 0.001* |
| • Pressure ulcers | 23 (51.11%) | 5 (10.20%) | | |

On comparing severity between the control and experimental group at different interval time, no significant difference was seen during allotment. However, immediately after intervention 2.04% in the experimental group and 20.00% in the control group were in grade 2 and 4.44% were in grade 3 at (p=0.009). Following 8 weeks of intervention, there was not significance increase in severity of PUs in both group. (Table4).

Table 4
Comparison of severity of pressure ulcers in experimental and control group

| Variables | During allotment | | Immediately after intervention | | 8 weeks after intervention | |
|---------------------------|------------------|-------------|--------------------------------|-------------|----------------------------|-------------|
| | Experimental | Control | Experimental | Control | Experimental | Control |
| No pressure ulcers | 34 (63.99%) | 23 (51.11%) | 33 (67.35%) | 20 (44.44%) | 44 (89.80%) | 22 (48.89%) |
| Grade 1 | 15 (30.61%) | 21 (48.89%) | 15 (30.61%) | 14 (31.11%) | 4 (8.16%) | 12 (26.67%) |
| Grade 2 | 0 | 0 | 1 (2.04%) | 9 (20.00%) | 1 (2.04%) | 9 (20.00%) |
| Grade 3 | 0 | 0 | 0 | 2 (4.44%) | 0 | 2 (4.44%) |
| p value * | 0.070 | | 0.009 | | 0.001 | |

McNemar test; *: statistically significant, $p < 0.05$

The mean post-test knowledge of experimental groups at different intervals of time were significant at t-value of 5.77 (p=0.001). However, the mean post-test knowledge of control group at different intervals of time were not significant at t-value of -8.526 (p=1.00) (Table 5)

Table 5
Comparison of knowledge score between control and experimental group before and after implementation

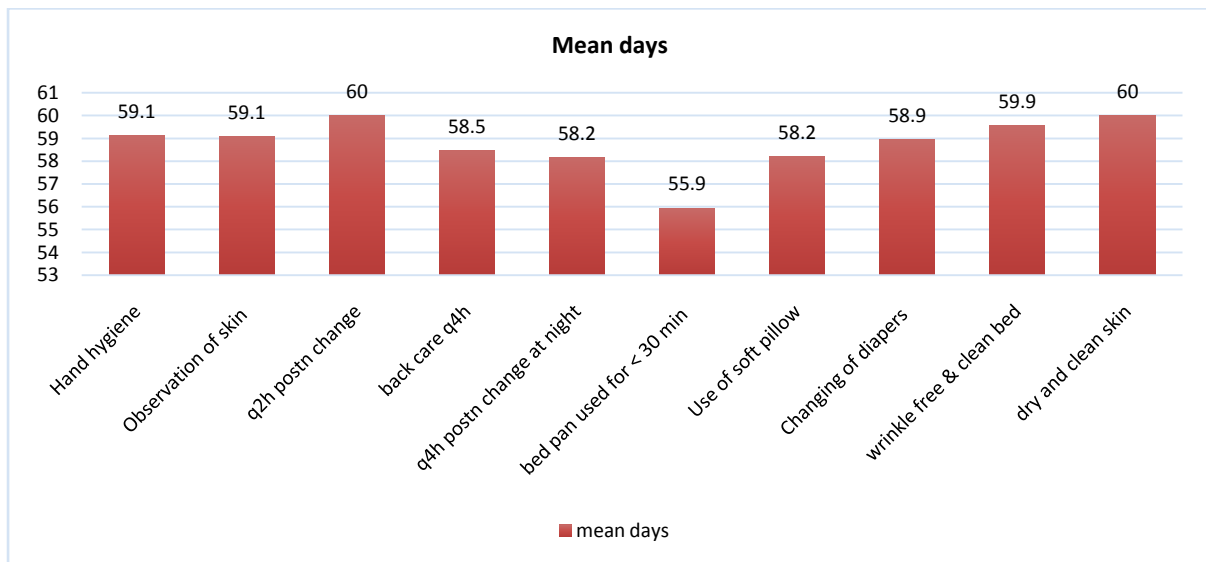
| Groups | Mean ± SD | t value | p-value |
|-----------------------------------|-------------|---------|---------------|
| Control (pre-test) | 3.4 ± 1.43 | 0.175 | 0.861 |
| Experimental (pre-test) | 3.34 ± 1.49 | | |
| Control (post-test 1) | 4.15 ± 1.41 | -23.68 | 0.001* |
| Experimental (post-test 1) | 9.55 ± 0.70 | | |

| | | | |
|-----------------------------|-------------|--------|--------|
| Control (post-test II) | 4.68 ± 1.48 | -11.49 | 0.001* |
| Experimental (post-test II) | 8.24 ± 1.50 | | |

Two sample t-test *: statistically significant, $p < 0.05$

The mean days of self-reported log sheets on practice of standard activities to prevent pressure ulcers in the experimental group were 60 for changing position second hourly in day time and keeping the skin dry and clean. Minimum mean days were 55.2 for using bedpan less than 30min. Other activities like back care for 4hourly, changings diapers immediately after wetting etc. were 58.2 to 59.9. There is good compliance to practice which may be the reason for fewer incidences of pressure ulcers in experimental groups (Fig.2)

Fig 2:Result of self-reported log-sheet for 60 days



IV. DISCUSSION

The incidence of pressure ulcers in baseline was similar in both groups but immediately after intervention and after 8 weeks, the incidence rate was significantly lower in experimental group as compared to the control group. These findings are similar to the findings of KathirvelSoundappan, et al who reported cumulative incidence of PU was 8.7% in PP1 and 21.7% in PP2, where there is less incidence rate in PP1 group compared to PP2 ($p < 0.001$). The decrease in incidence of pressure ulcers in the experimental group compared to the control group in the study might be due to better standard practice and continuous reinforcement regarding the prevention of pressure ulcers in hospital or home settings. When compared to baseline incidence of pressure ulcers at different intervals of time in experimental and control groups separately. There was a significant reduction of incidence in the experimental group ($p=0.008$, $df=1$) and no changes were seen in the control group. This finding of the study is supported by the findings of Moya (2008) study where she reported that the incidence of pressure ulcers reduced from 7% prior to educational program to 5% post education. The primary reason for the lower incidence of pressure ulcers in the experimental group is attributed to the active participation of caregivers in providing care. In contrast, relying solely on nurses in the control group makes it challenging to provide care to all patients effectively. Therefore, involving caregivers, providing education on the appropriate techniques, and sharing instructional videos on delivering standardized care not only improves their knowledge but also enhances their caregiving skills.

The severity of pressure ulcers in both groups were under Grade 1. Emine KırBiçer have also reported that ulcers were most often Stage 1 (326, 49.1%), located at the sacrum (364, 54.8%), and hospital-acquired (370, 55.7%; 175 (56%). In present study, the severity has increased more in the control group up to grade 3 (4.44%) whereas after 8 weeks of intervention in the experimental group the severity has reduced (89.80%).

The mean pre-test knowledge of both caregiver groups was comparable. After the immediate intervention, it was found that there is a statistically significant gain in knowledge in the experimental group compared to the control group. Moreover, after 8 weeks of intervention the knowledge remains consistently higher in the experimental group. The present study findings are in concordance with Maneesh Sharma et al who reported in pre-test the sampled subjects were having poor knowledge regarding care of pressure sore i.e. about 41%. And in the post-test the sampled subject had an improved knowledge regarding care of pressure sore i.e. about 100 %. The higher knowledge in the experimental group can be due to effective education with the help of video-assisted teaching, re-demonstration about caring steps to prevent pressure ulcers and interactive sessions to clarify the doubts.

Implications

In nursing practice, the video can serve as a valuable tool for providing discharge counselling to caregivers and paid attendants. It can also aid community health nurses in reinforcing teaching to care providers and family members of patients who are bedridden or chair-bound at home.

In nursing education, the video can be incorporated into the pre-service training program for nursing students to teach them about home care for preventing pressure ulcers. Furthermore, it can be utilized for on-going in-service education of nursing personnel across different settings.

In nursing administration, it is recommended to have the video available in the wards for staff and caregivers to access. The continuous display of the video can serve as a reinforcement of standard practices.

Strength

The study utilized a randomized controlled trial design to evaluate its effectiveness. Sustained effectiveness was assessed through periodic evaluations conducted at different time intervals.

Limitations

The study had limitations in terms of its use of consecutive sampling and its focus on a single setting.

Future recommendations

Similar studies can be done with larger sizes in multiple settings with multidisciplinary team. A study with longer duration follow up can be taken up to have more evidence about the retention of knowledge and practice.

REFERENCES –

- [1]. AfzaliBorojeny L, Albatineh AN, HasanpourDehkordi A, GhaneiGheshlagh R. The Incidence Of Pressure Ulcers And Its Associations In Different Wards Of The Hospital: A Systematic Review And Meta-Analysis. *Int J Prev Med.* 2020 Oct 5;11:171. Doi: 10.4103/Ijpv.M.IJPVM_182_19. PMID: 33312480; PMCID: PMC7716611.
- [2]. Edsberg LE, Black JM, Goldberg M, Mcnicholl, Moore L, Sieggreen M. Revised National Pressure Ulcer Advisory Panel Pressure Injury Staging System: Revised Pressure Injury Staging System. *J Wound Ostomy Continence Nurs.* 2016 Nov/Dec;43(6):585-597. Doi: 10.1097/WON.0000000000000281. PMID: 27749790; PMCID: PMC5098472.
- [3]. Livesley NJ, Chow AW. Infected Pressure Ulcers In Elderly Individuals. *Clin Infect Dis.* 2002 Dec 1;35(11):1390-6. Doi: 10.1086/344059. Epub2002 Nov 4. PMID: 12439803.
- [4]. Garcia AD, Thomas DR. Assessment And Management Of Chronic Pressure Ulcers In The Elderly. *Med Clin North Am.* 2006 Sep;90(5):925-44
- [5]. Christian N Kirman. Pressure Injuries (Pressure Ulcers) And Wound Care: Practice Essentials, Background, Anatomy,. [Cited 2022 Jan 23]. Available From: <https://emedicine.medscape.com/article/190115-overview>
- [6]. K. Agrawal And N. Chauhan, "Pressure Ulcers: Back To The Basics," *Indian J. Plast. Surg.*, Vol. 45, No. 2, P. 244, 2012.
- [7]. Sivasankar Arumugam, Rajesh Ranganathan, T Ravi. Surface Customization Through Additive Manufacturing For Prevention Of Decubitus Ulcers – A Concept Paper; 2018; Volume-1-Number 2-2018 ISSN 2395-4221
- [8]. Allman RM. Pressure Ulcer Prevalence, Incidence, Risk Factors, And Impact. *Clin Geriatr Med.* 1997 Aug;13(3):421-36. PMID: 9227937.
- [9]. Sen CK, Gordillo GM, Roy S, Kirsner R, Lambert L, Hunt TK, Et Al. Human Skin Wounds: A Major And Snowballing Threat To Public Health And The Economy. *Wound Repair Regen Off Publ Wound Heal Soc Eur Tissue Repair Soc.* 2009 Dec;17(6):763-71.
- [10]. Severens JL, Habraken JM, Duivenvoorden S, Frederiks CM. The Cost Of Illness Of Pressure Ulcers In The Netherlands. *Adv Skin Wound Care.* 2002 Mar-Apr;15(2):72-7. Doi: 10.1097/00129334-200203000-00008. PMID: 11984050.
- [11]. Lyder CH, Ayello EA. Pressure Ulcers: A Patient Safety Issue. In: Hughes RG, Editor. *Patient Safety And Quality: An Evidence-Based Handbook For Nurses* [Internet]. Rockville (MD): Agency For Healthcare Research And Quality (US); 2008 [Cited 2021 Dec 28]. (Advances In Patient Safety). Available From: <http://www.ncbi.nlm.nih.gov/books/NBK2650/>
- [12]. Lyder CH, Grady J, Mathur D, Petrillo MK, Meehan TP. Preventing Pressure Ulcers In Connecticut Hospitals By Using The Plan-Do-Study-Act Model Of Quality Improvement. *Jt Comm J Qual Saf.* 2004 Apr;30(4):205-14.
- [13]. Kaur S, Sharma U. Knowledge, Beliefs And Practices Of Caregivers Regarding Home Based Bedsore Care In Chandigarh, North India. *J Postgrad Med Educ Res.* 2013 Sep;47(3):138-43.
- [14]. Garcia AD, Thomas DR. Assessment And Management Of Chronic Pressure Ulcers In The Elderly. *Med Clin North Am.* 2006 Sep;90(5):925-44
- [15]. Hassan Askari, Fariba Yaghoobinia, Aliakbar Keykhah, Fateme Karimi. Investigating The Effect Of Home-Based Training For Family Caregivers On The Incidence Of Bedsore In Patients With Stroke In Ali Ebne Abitaleb Hospital, Zahedan, Iran: A Clinical Trial Study; 2018 Dec; 1-4; Doi: 10.5812/Msnj.87325.

- [16]. Bergquist S, Frantz R. Pressure Ulcers In Community-Based Older Adults Receiving Home Health Care. Prevalence, Incidence, And Associated Risk Factors. *Adv Wound Care*. 1999 Sep;12(7):339-51. PMID: 10687554.
- [17]. KottnerJ,Halfens R, Dassen T. An Interrater Reliability Study Of The Assessment Of Pressure Ulcer Risk Using The Braden Scale And The Classification Of Pressure Ulcers In A Home Care Setting. *Int J Nurs Stud*. 2009 Oct;46(10):1307-12. Doi: 10.1016/J.Ijnurstu.2009.03.014. Epub2009 Apr 29. PMID: 19406400.
- [18]. Wu X, Li Z, Cao J Et Al. The Association Between Major Complications Of Immobility During Hospitalization And Quality Of Life Among Bedridden Patients: A 3 Month Prospective Multi-Center Study. *PlosOne*. 2018 Oct 12;13(10):E0205729. Doi: 10.1371/Journal.Pone.0205729. PMID: 30312330; PMCID: PMC6185860.
- [19]. Anrys C, Van Tiggelen H, Verhaeghe S, Van Hecke A, Beeckman D. Independent Risk Factors For Pressure Ulcer Development In A High-Risk Nursing Home Population Receiving Evidence-Based Pressure Ulcer Prevention: Results From A Study In 26 Nursing Homes In Belgium. *Int Wound J*. 2019 Apr;16(2):325-333. Doi: 10.1111/Iwj.13032. Epub2018 Nov 9. PMID: 30412652; PMCID: PMC7949181.
- [20]. Gillespie BM, Chaboyer WP, McinnesE, Kent B, Whitty JA, Thalib L. Repositioning For Pressure Ulcer Prevention In Adults. *Cochrane Database Syst Rev*. 2014 Apr 3;2014(4):CD009958. Doi: 10.1002/14651858.CD009958.Pub2. Update In: *Cochrane Database Syst Rev*. 2020 Jun 2;6:CD009958. PMID: 24700291; PMCID: PMC6769133.
- [21]. Yap TL, Kennerly SM, Horn SD, Bergstrom N, Datta S, Colon-Emeric C. TEAM-UP For Quality: A Cluster Randomized Controlled Trial Protocol Focused On Preventing Pressure Ulcers Through Repositioning Frequency And Precipitating Factors. *BMC Geriatr*. 2018 Feb 20;18(1):54. Doi: 10.1186/S12877-018-0744-0. PMID: 29463211; PMCID: PMC5820803.
- [22]. Niederhauser A, VandeusenLukas C, Parker V, Ayello EA, Zulkowski K, Berlowitz D. Comprehensive Programs For Preventing Pressure Ulcers: A Review Of The Literature. *Adv Skin Wound Care*. 2012 Apr;25(4):167-88; Quiz 189-90. Doi: 10.1097/01.ASW.0000413598.97566.D7. Erratum In: *Adv Skin Wound Care*. 2012 Jul;25(7):300. PMID: 22441049.
- [23]. Baernholdt M, Yan G, Hinton ID, Cramer E, Dunton N. Effect Of Preventive Care Interventions On Pressure Ulcer Rates In A National Sample Of Rural And Urban Nursing Units: Longitudinal Associations Over 4 Years. *Int J Nurs Stud*. 2020 May;105:103455. Doi: 10.1016/J.Ijnurstu.2019.103455. Epub2019 Nov 5. PMID: 32203754; PMCID: PMC7279703.
- [24]. Beeckman D, Serraes B, Anrys C, Van Tiggelen H, Van Hecke A, Verhaeghe S. A Multicentre Prospective Randomised Controlled Clinical Trial Comparing The Effectiveness And Cost Of A Static Air Mattress And Alternating Air Pressure Mattress To Prevent Pressure Ulcers In Nursing Home Residents. *Int J Nurs Stud*. 2019 Sep;97:105-113. Doi: 10.1016/J.Ijnurstu.2019.05.015. Epub2019 Jun 8. PMID: 31234104.