

Impact of Harness and Cart Design on Working Equid Welfare and Health in Western-Central Morocco

Zineb EL Brini^{1*}, Mahdi Tabache², and Hassan Alyakine¹

¹ Department of Medicine, Surgery, and Reproduction, Agronomy and Veterinary Institute Hassan II, Rabat 10000, Morocco

² Veterinary Practitioner, Private Practice, Morocco

*Correspondence: z.elbrini@iav.ac.ma

INTRODUCTION & AIM

INTRODUCTION

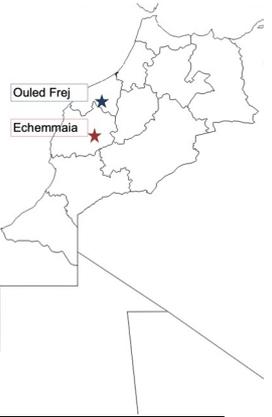
Working equids remain essential to rural and peri-urban livelihoods in Morocco, supporting transport, agriculture, water distribution and income-generating activities.

However, locally manufactured harnesses and carts are often made from recycled and non-standardised materials, which may result in poor fit, inadequate padding and mechanical imbalance, increasing the risk of chronic friction and skin lesions.

AIM

To (1) characterise working equids, harnessing practices and cart design in two Moroccan regions (Oulad Frej and Echemmaia), and (2) evaluate associations between equipment-related factors, body condition score (BCS) and the occurrence and distribution of harness-related lesions.

- Cross-sectional field study
- 155 randomly selected working equids
- Recorded: species, age, sex, and body condition score (BCS)
- Harness assessment: condition, padding, fit, and assembly
- Cart assessment: type, balance, and structural defects
- Statistical analysis:
 - Chi-square tests
 - Multiple correspondence analysis (MCA),
 - Significance level set at $p < 0.05$



RESULTS & DISCUSSION

Population

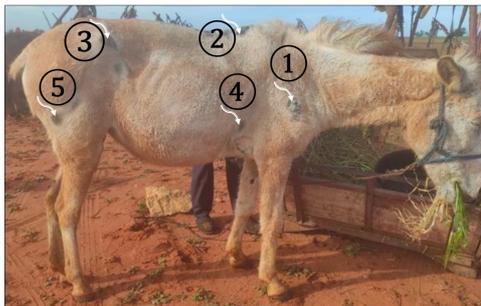
- 66% horses, 21% donkeys, 14% mules
- Mean age: 7.5 ± 3.2 years
- Mean BCS: 2.5 ± 0.85

Injury prevalence

- 89.7% had ≥ 1 harness-related lesion
 - 70.3% superficial
 - 19.4% deeper
- ↓ BCS → ↑ Wound risk ($\chi^2 = 13.89$; $p = 0.003$)

Most affected anatomical regions

- 1 Prescapular region: 52.3%
- 2 Withers: 42.6%
- 3 Flanks: 31.6%
- 4 Girth area: 30.3%
- 5 Buttocks: 27.1%



Low BCS and typical anatomical sites at risk of equipment-related injuries.

Harness deficiencies

- 22% poor structural condition
- 30% poorly adjusted
- 40% poorly padded
- 30% poorly assembled
- Draft collar absent in 100% of cases

All these defects are visible here



Example of suboptimal harness configuration in a working equid

Cart deficiencies

- 6 No singletrees (0%)
- 7 57% underinflated wheels
- 8 56% protruding structural elements
- 9 41% excessive tilt



Representative cart configuration illustrating key structural deficiencies identified in the study.

Interpretation

- Predominantly superficial lesions indicate chronic harness-related friction (Reix et al., 2014; Ali et al., 2015).
- Low BCS increases vulnerability due to reduced soft tissue coverage (Pritchard et al., 2005).
- Cart imbalance and structural defects likely impair load distribution and increase localized stress (Merridale-Punter et al., 2024).

CONCLUSION

- ✓ Working equids in western-central Morocco exhibit a high burden of predominantly superficial, equipment-related injuries.
- ✓ Low BCS and modifiable harness and cart deficiencies were significant determinants of wound occurrence.
- ✓ Improving load distribution, harness design, and management practices represents an achievable and evidence-based approach to reducing preventable injuries and improving welfare outcomes.

FUTURE WORK / REFERENCES

• FUTURE WORK

- Development of locally adapted harness guidelines
- Integration of welfare training in rural communities
- Evidence-based policy recommendations

REFERENCES:

- Ali, A.B.A., Matarok, M.Y., Fouad, M.A., Heleski, C.R., 2015. Are mules or donkeys better adapted for Egyptian brick kiln work? (Until we can change the kilns). *J. Vet. Behav.* 10, 158–165. <https://doi.org/10.1016/j.jveb.2014.12.003>
- Merridale-Punter, M.S., Wietheiler, A.K., El-Hage, C.M., Patrick, C., Hitchens, P.L., 2024. Common clinical findings identified in working equids in low- and middle-income countries from 2005 to 2021. *PLoS ONE* 19, e0304755. <https://doi.org/10.1371/journal.pone.0304755>
- Pritchard, J.C., Lindberg, A.C., Main, D.C.J., Whyte, H.R., 2005. Assessment of the welfare of working horses, mules and donkeys, using health and behaviour parameters. *Prev. Vet. Med.* 69, 265–283. <https://doi.org/10.1016/j.prevetmed.2005.02.002>
- Reix (née Broster), C.E., Burn, C.C., Pritchard, J.C., Barr, A.R.S., Whyte, H.R., 2014. The range and prevalence of clinical signs and conformation associated with lameness in working draught donkeys in Pakistan. *Equine Vet. J.* 46, 771–777. <https://doi.org/10.1111/evj.12231>